

## MANAGEMENT VIEW

### IMPROVEMENT IN TECHNOLOGY, NOT KW--

"Time has indicated that such an approach --gaining experience from utility-size power reactors while conducting a broad developmental program stressing research and prototype reactor construction--is sound . . . and that improvement in technology and not kilowatts is the essential ingredient for the ultimate success of our nation's program." The chairman of EEI's committee on atomic power, Wm. J. Clapp, so testified at Congressional hearings on the state of atomic energy development. The president of Florida Power Corp. added: "Government's role in civilian nuclear power activities should be limited to fostering research and development and the investigation of promising reactor concepts. In fulfilling this role, government should use the services of the electric utility industry to the maximum extent possible."

"WE HAVE NOT BEEN HURT TOO MUCH by the general business downturn of the past several months," Chairman Willis Gale noted in Commonwealth Edison's annual report. "We doubt, however, that this trend can continue indefinitely without adversely affecting our earnings," he warned. "On the other hand, we are hopeful business in general will turn up in the not too distant future, and that, for the full year 1961, we will show increases in our sales, revenues and per-share earnings."

MERGER: GOAL OF MORE AND MORE--The consolidation of Pacific P.&L. Co., and California-Oregon Power Co. has been proposed to the FPC, largely on the contention that the merged company would be able to finance needed new construction more advantageously than two smaller companies; in Alabama, a textile manufacturer (West Point Mfg. Co.) would abandon electric service to 3700 customers in four communities, if the FPC okays its proposal to sell and lease its electric distribution facilities to Alabama Power Co.; and in New York, Con Edison has received approval from the state commission to merge a wholly owned company (Con. Tel. & Elect. Subway), from which it rents underground conduit.

A REDUCTION IN PERSONNEL OF 18% was achieved over the past decade in the face of a 100-percent increase in electric energy sales, more customers and expanding generating, transmission and distribution facilities, Toledo Edison's Pres. John K. Davis informed the N.Y. Society of Security Analysts last month. Accompanying this program was a program for "management training in depth" to develop personnel to succeed top management people reaching retirement age, he reported. To date, over 50 people have completed the utility's three-year managerial development course.

"GALVANIC" EARNINGS CONSEQUENCE has been the lot of shareholders in Citizens Utilities Co. of Stamford, Conn. Since 1945, the utility reports, its per-share earnings have increased over 900-percent, including a four-cent per share boost (to 60-cents) in its annual dividend rate--the 15th in the past 16 years. Citizens' Pres. Richard L. Rosenthal said this action was "in continuing conformance with the utility's announced policy of coupling dividend payment rate with earnings progress."

## ECONOMIC CLIMATE

STEADY ACTIVITY at a level that is historically high is in prospect for the economy over the next few months. The declining tendency that can be seen in most of the major business indicators apparently will not be reversed speedily. On balances, however, anticipated sources of future strength can be expected to turn the trend and eventually to give rise to a resumption of economic growth.

CONSUMER PLANS for purchasing give little reason to hope for an upsurge. But it must be remembered that the plans were made in a period of uncertainty, doubt, and politically-minded denigration of the nation's economic vitality. As time goes on and it becomes apparent that fears have given rise to exaggerated caution, there will no doubt be a reaction and people will loosen their purse strings and make more purchases of major durables.

THIS CHANGE will be most welcome when



## NEWS IN PERSPECTIVE

it comes. At present, consumers' expectations call for buying new and used autos at about 1960 levels, fewer refrigerators and washing machines but more TV sets, and fewer new and used houses. Note, however, that at the same time that spending plans were being cautiously stated, nearly 25-percent of the people queried for the Federal Reserve Board expected their incomes to increase during 1960 while only six-percent anticipated a drop. To be sure, nearly 20-percent had already suffered some income reduction, presumably related at least in part to business conditions. Consumer purchases of services and some nondurable goods nevertheless remain--along with exports and government demand--among the conspicuously strong spots in the national economy.

MANUFACTURERS SPENT MORE in the first quarter of '61 than a year earlier on construction of new plants, renovation of old ones--up to \$14.3-billion.

### WASHINGTON INFLUENCE

MIXED CONGRESSIONAL REACTION to President Kennedy's message on natural resources seems to confirm the comment made by Sen. Wallace Bennett (R., Utah)--that it was one of the most politically oriented messages ever sent to Congress. Public power advocates hailed the doctrine from on high and partnership proponents bitterly resented criticism of Eisenhower policy. The one reaction missing was surprise since Interior Secretary Udall's plain-spoken press conferences clearly indicated emphasis on public power, comprehensive river basin development, vast transmission grids, and cooperating pooling of public and private power. (See "Washington Outlook," page 10.)

RECLAMATION SPENDING during 1963 and 1964 will run at the rate of \$300-million a year, Commissioner Dominy says. If economic pump-priming is needed to combat recession, about \$30-million could be added in 1962 and \$50-million in the following year. At present, Interior markets power from 42 plants with over 5-million kw capacity. Under construc-

tion are nine more with 1.6-million kw of capacity, and plans call for another 20 with capacity of over 580,000 kw.

STUDY OF INTERIOR DEPARTMENT will be made by Resources for the Future, Inc., Sec. Udall says. The Ford Foundation group will undertake a "thoroughgoing analysis" of the Department's "planning, policy making and research functionings."

UTILITY REIMBURSEMENT for costs of relocating their facilities when forced by highway building has been proposed in Georgia, Indiana, and Pennsylvania. A Massachusetts proposal would repeal the local reimbursement law. Indiana and Pennsylvania proposals would make relocation a part of highway cost. Montana proposals envisage reducing utility reimbursement by imposing stiffer qualification rules. Legislation in New Mexico proposes making reimbursement retroactive to 1954. California legislature considers formation of utility coordinating committees to consider placement of utility facilities, eliminating unnecessary relocation.

SUPREME COURT is being asked by California to review FPC's treatment of liberalized depreciation. Case at issue involves gas, not electricity, rate and impact of FPC view on liberalized depreciation.

REGULATORY AGENCIES, including FPC, will be subjected to scrutiny from a new permanent subcommittee of the House Commerce Committee. Chairman Oren Harris (D., Ark.) wants to be sure the gap between agency promise and performance is closed, whether by legislative or administrative action.

PURCHASING SPEED-UP by the Bureau of Reclamation is reaching as much as two years ahead. Example: bids are out on cable and insulators for the Colorado River Storage Project originally planned for a 1963 "furnish and install" contract. Reclamation Commissioner Dominy hopes to award the contract for Yellowtail Dam in May instead of June, speeding award by the contractor of millions of dollars worth of construction items.



BIDS ON GLEN CANYON UNITS will be opened April 11, with the eight 112,500-kw generators to be the largest in capacity to be installed on a Bureau of Reclamation project. The Bureau's invitation calls for installation of the first of the 2.2-million pound units within 990 days.

U.S. VALVE FIRM is awarded contracts for six butterfly valves for three hydro plants now being built for California's Central Valley Project. Nordberg Mfg. Co., Milwaukee, underbid foreign competitors without invoking the six percent differential in favor of U.S. firms under the Buy American Act.

NEW CONTRACTS FROM TVA, announced last month, included a \$17.4-million one to Combustion Engineering, Inc. for the boiler of one of two large turbo-generators on order from GE. The boiler will deliver 6.1-million pounds of steam per hour, at a pressure of 2,400-psi and temperature of 1,050/1000-deg. F. TVA also announced it had accepted an alternate GE design for the turbo-generators that will increase gross capability of the two units (by 35,000-kw) to 900,000-kw--adding \$1-million to the cost of each and bringing the total cost for both to \$32.76-million.

TAMPA ELECTRIC'S LEGAL SUIT to force Nashville Coal Co. to live up to the terms of their 20-year "requirements contract" for fuel for the first two units of the Gannon Station has been upheld by the U.S. Supreme Court. The 7-2 decision reverses the rulings of the District Court and the U.S. Court of Appeals. Justice Tom Clark, writing for the majority, stated the "20-year period of contract is singled out as the principal vice, but at least in case of public utilities the insurance of steady and ample supply of fuel is necessary, in the public interest."

## INDUSTRY SIFTINGS

TVA COMPLAINTS ON BID-RIGGING and price fixing extended last month to the cement and aluminum (conductor cable) industries. (As in the case of electrical equipment manufacturers, suppliers explained that prices are standardized in published catalog lists.) TVA officials claim they are doing business a big favor

in trying to inject real competition and in working for lower prices and, therefore, more consumption. (Officials of the National Institute of Governmental Purchasing, meanwhile, are proceeding on a plan for preparing civil suits against electrical manufacturers, after documentation of alleged losses is completed, probably this month.)

BUT, CONVICTED COMPANIES maintained that alleged losses may not have occurred. For example, General Electric contends that a record of price changes for products involved in the Justice Dept. actions in 1954-'59 "exhibit striking similarities with those for comparable complex mechanical equipment where unquestioned competitive pressures have been at work." And, in an appearance before the N.Y. Society of Security Analysts, GE's Cordiner noted that, of 24 companies he had called on, not one complained about damages suffered. In later remarks in Chicago, Mr. Cordiner again absolved GE's top management of any knowledge or responsibility in the anti-trust violations and defended the company's decentralized organization (which allows managers of more than 100 departments to establish prices and otherwise fully operate their units.)

NEMA GOES WEST FIRST TIME--In June (8 and 9), the National Electrical Manufacturers Assoc. is meeting at the Biltmore in Los Angeles. On the agenda: the Association's "growing interest in the Far West . . . and attention to safety regulations and product standards as they affect Western manufacturers specifically and the electrical industry generally."

UTILITY PROMOTION PACKAGE is the main vehicle of NEMA's 1961 housewares campaign, with the overall theme: "Electric Housewares are Helping Hands . . . Give Her Another Helping Hand Soon!" Urging utilities to promote housewares year-round, the report accompanying the promotion material reminds utility executives that electric housewares accounted for more than 2.95-million-kwh in 1959, earning for utilities \$535-million out of total revenue of \$4.3-billion.

NEW SALES FORECASTING FORMULA developed by RCA for its own use is being offered for free to business firms, with a "do-it-yourself" manual of instructions plus assistance in applying it.





## Power Policy—New Frontier Style

The Kennedy Administration's power policies have been spelled out. They are built to specifications laid down by former Interior Secretary Harold Ickes, and form a blueprint for aggressive expansion of government power activities.

Republican brakes applied to the federal power joyride of the New and Fair Deals have been released. The advocates of socialized electric service are warming up for a fresh start under the New Frontier banner.

How far and how fast the public power promoters may be able to roll in the years ahead will be a guessing matter for some time, and will depend largely on which way the political winds blow on Capitol Hill. As it stands now, the overall picture is a decidedly discomfoting one for a substantial segment of the investor-owned electric utility industry.

The possibility—as hopefully pointed to in some industry quarters—that the conservative coalition of southern Democrats and Republicans in Congress may be able to block appropriations for any far-reaching expansion of government power, is a mitigating factor whose proportions can't be measured until the chips have gone down on specific proposals. A factor that is known (at least to those who lived through the Roosevelt-Truman era with their eyes open) is the mischief that can be done via executive order and at the administrative level.

Most of President Kennedy's cabinet and sub-cabinet appointments have been widely hailed as reflecting a middle-road course which should dispel much of the uneasiness shown by the business community following the election. To the extent that this viewpoint is valid, it serves to point up the glaring exception in the pattern of appointments to key posts having to do with federal power activities and the federal regulation of elec-

tric utilities. There the picture is grotesquely lopsided with men of strong public power leanings. (See March 15 issue, page 49.)

Particularly significant in this area was the President's announcement he would appoint to FPC membership Joseph Swidler, former TVA general counsel, and Howard Morgan, former Oregon Public Utilities Commissioner. (Their nominations still hadn't gone up to the Senate at this writing.) Currently, about 95 percent of FPC's workload is related to matters under the Natural Gas Act. Why, then, name to the Commission two men who apparently have had no experience whatever with the problems of regulating the natural gas industry?

Obviously, leaders of the government power bloc have been riding the inside track in the new administration's formulation of power policy and appointments to power-related jobs. They had a hand in drawing up the Democratic platform plank covering natural resource and power development, and are believed to have fed Mr. Kennedy much of the material for his campaign speeches touching on those subjects.

Shortly after the election, a group of well known public power promoters had a visit with Mr. Kennedy. They said they talked about speeding up the development of western water resource projects. It's a safe bet they also talked about, and reached some understanding regarding, power policies and appointments.

The President made it clear in his special message to Congress on natural resources that his administration intends to broaden what has become the federal utility responsibility. The role of government in supplying "an important segment" of the nation's power needs "is now long established and must continue," he said. "We will meet our responsibilities in this field."

Interior Secretary Stewart Udall put it this way in proclaiming the Department's new power policy: "The furnishing of an adequate supply of low-cost power for the homes, farms, and industry sufficient to service a dynamic economy is a matter of basic importance to the economic growth and defense of the nation and is, therefore, a matter of governmental concern."

In the activation of the new policies, it is possible a strong play may be made for broadening federal construction of steam generating plants. Some influential public power people are privately arguing, with mounting insistence, that since the construction of such plants has long become an "accepted practice" for the TVA area—not only for firming up hydro-power but for meeting an outright federally assumed utility responsibility—the time has come to push all-out for federal thermal plant breakthroughs in other regions.

Another possibility getting attention from these same people is the further stepping up of the use of two percent REA money to finance super co-op generating and transmission systems that could be integrated with federal systems. REA loans for G & T purposes, once the exception, are fast becoming the rule. Of a total of \$254-million in REA electric loans made in 1960, some \$120-million or nearly 50-percent went for G & T facilities. There should be little difficulty in bringing a sharp rise to that percentage under the Kennedy Administration policies.

Both public and private power resources of the Northwest area should be used to the fullest extent, Charles F. Luce, new administrator of the Bonneville Power Administration believes.

Stating this in his inaugural policy pronouncement, Mr. Luce pledges BPA's fullest cooperation through its wheeling program, system power studies and technical assistance to both privately and publicly owned utilities.





## MANAGEMENT-MARKETING

Market Research Is Beginning and End . . .

### Detroit Edison Sales Program Seeks Right Balance: Analysis, Judgement; Customer Needs, Company Aims

Market research is the beginning and end of a newly developed sales programing approach being used at Detroit Edison to implement the premise that "we must plan and work for prosperity or it will not work for us."

How Detroit Edison marketing specialists have applied principles involving new dimensions in selling was described in a presentation last month by Howard R. Stevenson, asst. vice-president, for a seminar of the American Marketing Association. He outlined the Detroit Edison program, beginning with the acknowledgement that, "we in utility marketing management have not inherited the privilege of sharing in a prosperity that we have not helped to create."

Mr. Stevenson also conceded that in the past marketing management has been inclined to create sales programs without a complete understanding of costs versus results . . . and has been inclined to perpetuate them so long as total sales and average use per customer continued on a rising plane. This occurred generally, he noted, because much of the industry's growth came historically from the rapid acceptance of non-competitive products in a dynamic economy . . . while only a portion has come from the choice of electricity as opposed to other forms of energy when both were available and both could do the job. Now, to meet kilowatt-hour and revenue objectives in the years ahead, said Mr. Stevenson, it will also be necessary to stimulate increased use of competitive products such as the electric range, dryer, water heater and complete home heating.

"Now, more than ever before we have assembled and analyzed mar-

ket facts in planning our program elements. We have tried to build-in program flexibility in order to quickly adjust to changing market conditions. And, more than ever before, we have established control procedures in order to measure sales results in terms of cost."

*(Detroit Edison's economic analysis of its service area concedes that the impact of dynamic conditions which marked the early 1950's will not resume before the mid-sixties —pointing the way to the utility's concentration on the replacement, or the conversion of present customers to higher degrees of electric living. Meanwhile, in early 1961, Detroit Edison executives are busy helping the city's economy meet the recession that puts this community in the forefront of the Administration's anti-recession efforts.)*

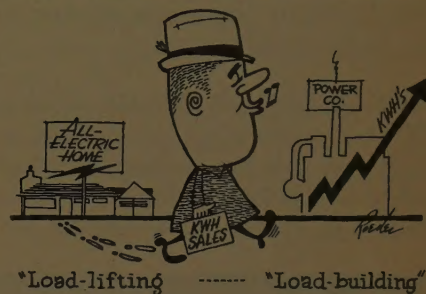
Detroit Edison, according to Mr. Stevenson, looks at its total market in terms of four individual markets or regions, each with its own characteristics for promotional purposes. "We have discovered that no single umbrella-like promotional approach can be equally effective everywhere in these different regions," he observes.

Detroit Edison aims at these market objectives with its promotion and selling effort:

1. Conversion of existing customers to electric ranges and water heaters
2. Conversion of existing customers to electric clothes dryers, plus sales to non-dryer owners
3. Continued development of the small but expanding electric heating market.

Next, the Detroit utility decided on these procedures around which the sales program is developed:

1. Direct merchandising of elec-



"Load-lifting"

"Load-building"

### Sporn: Electric Power-Aluminum Tie to Grow

By 1980, when annual aluminum production in the U. S. may reach a total of 10-million tons, there will be no difficulty in obtaining the additional 140- 150-billion kwh per year that this will call for, on a sound economical basis.

This prospect was described for the commemoration last month of Aluminum's 75th anniversary by Philip Sporn, of American Electric Power Co. He advised, however, that the electric power industry must continue to improve the technology of energy conversion to help bring about reductions in cost at the very minimum to keep costs from rising.

In his remarks, Mr. Sporn noted that: (1) In a broad way there is likely to be a continuation of the relationship where, today, aluminum production accounts for almost 1/20th of the total electric energy used in the U. S. and the electrical use of aluminum accounts for 1/8th of all the primary aluminum produced; and (2) Aluminum production operations are likely to proceed on the kind of economic foundation already indicated by three Ohio Valley projects—largely because the possible economics are so much more favorable, integrated with or operating as part of major, area-wide steam-electric systems.

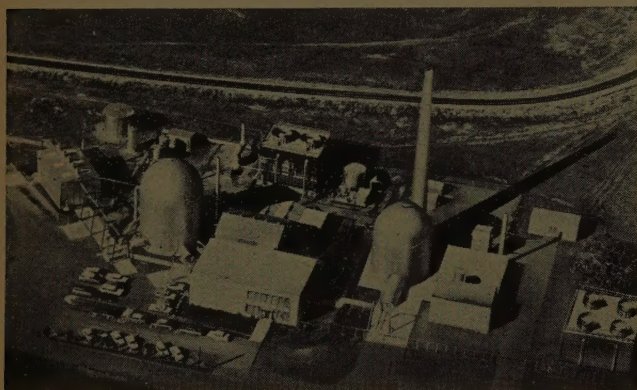
tric water heaters and dryers

2. Active support for the electric sales efforts of dealers and plumb-



**HOW TO GET IT TO GROW AND PROSPER** — This aim for the nuclear electric power industry, expressed by Glenn T. Seaborg in his appearance before Senate members of the Joint Congressional Committee seeking their approval of his appointment as AEC chairman, was accompanied by the comment that the U. of Cal. chancellor was not sure how this best could be accomplished.

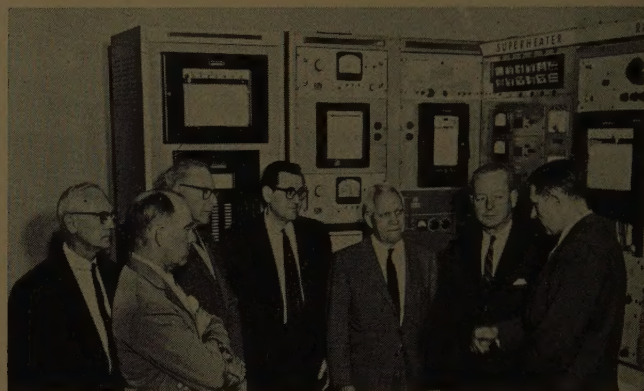
**ENCOURAGING TO THE AEC**, Commissioner Robt. E. Wilson, reported to the Joint Congressional Committee on Atomic Energy in annual "202 Hearings" late in February, is the fact that the utility industry is giving serious consideration to nuclear reactors



Vallecitos Experimental Superheat Reactor, with its towering 160-ft exhaust stack (to the center and right in cut at left above) is shown in artist's conception of completed Vallecitos Atomic Laboratory plant site. Seven New York state investor-owned utilities are participating with General Electric in the Empire State Atomic Development Associates, Inc. in the project aimed at extending the technology of nuclear superheat. ESADA officials are shown in a recent visit to Vallecitos (in right cut, above, before control console of the APED Superheat

as serious competitors to fossil fueled plants in certain areas in the reasonably near future. Results of the AEC's R & D programs also provided encouragement, the Commissioner noted. All-in-all, he observed, the year 1960 might be considered the year that the national nuclear power effort grew up—"when the hard realities of cost, safety and public acceptance became generally acknowledged."

**HIGHER INSURANCE REQUIREMENTS**, which will go into effect in mid-April, are based on a change in the population factor used—from a range of 1.0 to 1.5 to a new range of 1.0 to 2.0. Total requirements will not be as high as proposed by insurance industry.



Advanced Development Experiment) left to right: Messrs. McChesney, MacRae, Acker, Stoller, Hulswit, Doud, with GE's D. H. Imhoff. Supporting GE experimental facilities at this site is a newly installed SMART-programmed computer, located 30 miles away in San Jose where data is interpreted from a punched tape transmittal via telephone, then reproduced for transmittal back to Vallecitos over the same telephone lines. This greatly increases the ability of experimenters to direct the course of new experiments, says GE.

## Market Research (Cont.)

ers on a selective basis (limited to sales of ranges, dryers, heaters)

3. Promotional support to limited number of home builders who include electric living features on a quantity basis

4. Advice and counsel to sellers and installers of electric heating equipment and to customers installing it in their homes.

Then, Mr. Stevenson reported, the company took steps to provide for:

1. A promotional budget for each sales district, based on tentative quotas derived from analysis of market potentials

2. Considerable latitude in the management of promotional funds on the district level

3. Monthly reporting of appli-

ance and equipment sales by both Detroit Edison and other retail outlets

4. An analysis of cost/kw of load added

5. Managed use of sales representative's field time.

In the present Detroit setup, sales representatives are "practically their own sales managers, challenged to use their own powers of judgment and analysis . . . with flexibility of choice and action."

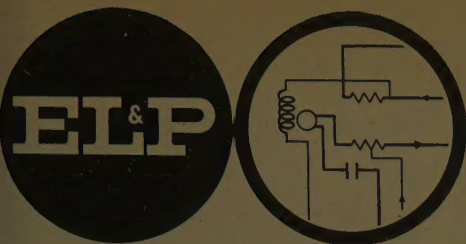
Mr. Stevenson summarized the utility's marketing philosophy this way:

"We feel that the success or failure of sales programs may be evaluated on the basis of any of four factors—from variations in market potential, from the program approaches themselves, from how they have been administered, and

from the capability of personnel to carry them out. To enable us to realistically appraise these factors, we instituted a new system of managed cost accounting . . . to provide a measure of program results.

"We hope that analyses of this kind will provide the necessary bridge of facts by which to reach our sales and revenue objectives—by complete and realistic evaluation of our markets, and through the medium of well managed sales programing resources. We know this new system is not perfect, and we know it will take several years of experiment and analysis to get the most value from it. But, we do believe it will bring us the right balance between factual analysis and creative judgment; between customer needs and company objectives," he concluded.





## ENGINEERING-OPERATIONS

### CE's Cable Tracer Increases Efficiency

A new cable and phase identifier is now in use throughout the Commonwealth Edison system. The equipment consists of a transmitter which sends coded signals through underground cable conductors and a detector which picks them up at a distant point on the line.

When a cable is to be taken out of service for repair or replacement, the transmitter is attached to the line in a generating station, substation or other terminal. The detector picks up the signal that indicates the proper cable and specific conductors to be worked on.

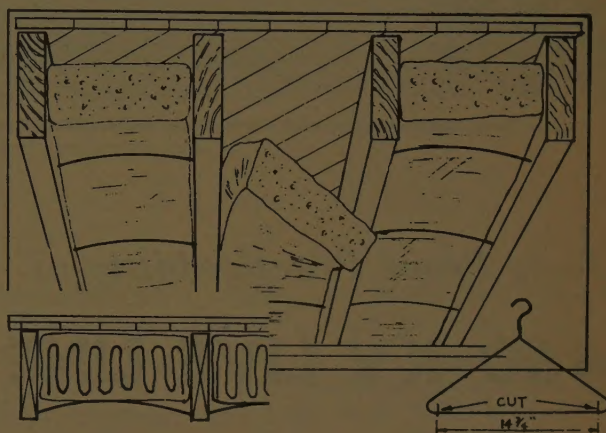
By identifying a de-energized cable before cutting into the insulation, the hazard of opening a wrong cable is eliminated. In addition, locating the individual conductors at the same time eliminates performing this time-consuming operation in the middle of the splicing job. Combining the two operations at the beginning of the job reduces considerably the total work time and cable outage time, and increases safety to personnel.

### Hang Up Heating Insulation Problems

Potential electric heating customers having trouble holding their six-in. Fiberglass batts in place

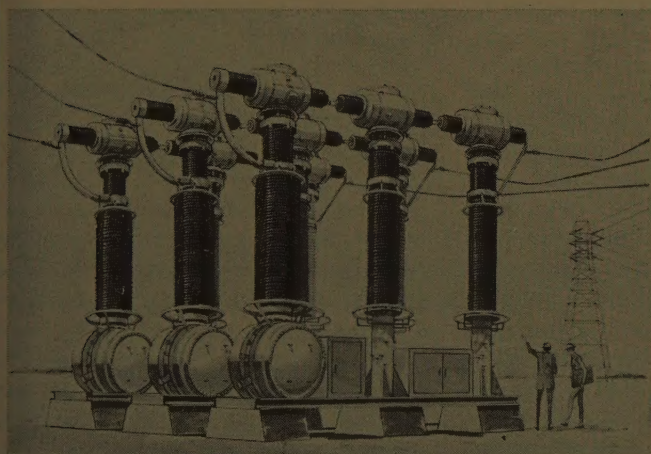
under the floor with the vapor barrier on the warm side? Help them solve the problem like Marvin Stacken, electric heating specialist for the Kansas Power and Light did.

He took a bunch of ordinary wire clothes hangers, cut them to the desired length, and wedged them between the floor joists, holding the batts up against the floor boards. He needed only three pieces of wire for each four-ft batt—500 to do his own floor-insulating job.



Three clothes hangers per four-ft insulating batt are needed to snug-up floor insulation needed for a good electric heating installation.

### Big Blast, Fast!



Here is how one of American Electric Power's 345-kv air blast breakers will look on completion. The breakers will be the first air blast design to be built at this voltage which will meet AEP's specifications of clearing short-circuit currents as high as 25-million kva in two cycles. Five of these units have been ordered from General Electric Co. Installation is scheduled in 1962. Citing the need for faster and more efficient power circuit breakers, C. P. Zimmerman, AEP Service Corp. Electrical Engineering Dept. head, explained that the increasing number of higher-output generators going into service makes it imperative that transient power faults be cleared quickly to keep the system in balance; hence the two-cycle interrupting time requirement.

### Foil Fights Fires



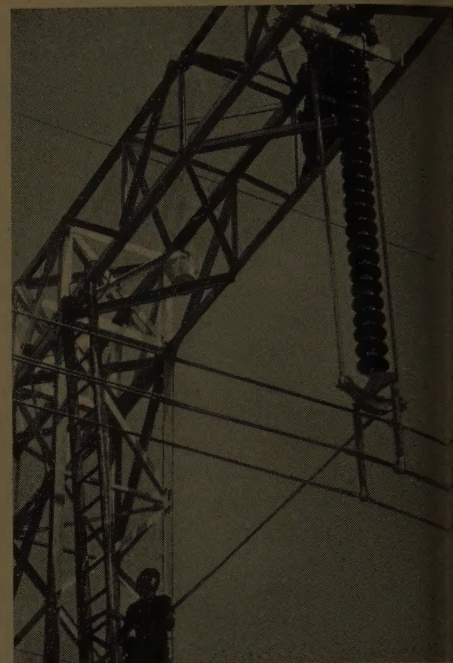
The hazard of fast-spreading grass and brush fires has been attacked by Washington Water Power. Lloyd Fisher, WWP division lineman, shows how easily and economically pole damage by fire can be prevented by wrapping the base of the pole with quilted heavy duty aluminum foil.





Two insulated sticks equipped with a metal yoke are used to lift and hold the conductor bundle.

After strain is removed from joint between insulators and conductor hardware, hardware is disengaged using A. B. Chance Co. hot-line tool.



## *Tests Prove Practicability of*

# 460-KV LIVE-LINE MAINTENANCE

*Confronted with future expansion of their transmission network at 460-kv, Ontario Hydro engineers develop and field test methods for maintaining lines while energized.*

By T. J. BURGESS, Line Maintenance Engineer, The Hydro-Electric Power Commission of Ontario

**T**HE FIRST PRACTICAL live-line maintenance on a 460-kv line ever undertaken in Canada, and possibly elsewhere, was performed recently when research design work on Ontario Hydro's Coldwater Project was suspended for a two-week period to enable the Line Maintenance Department to field test new methods and equipment developed for the purpose. With long EHV lines planned for the future, it was desirable to investigate the practical aspects of workmen climbing structures for inspection and maintenance of 460-kv circuits in order to plan methods for ensuring reliable and uninterrupted flow of bulk power.

The electrical phenomena of an EHV field as related to the human body have had little study. How-

ever, experience has shown that considerable voltage is built up in the bodies of linemen working on 115-kv and 230-kv energized lines when they are insulated from towers. Laboratory and field tests indicated in a more precise manner what was already known, that a discharge occurs when a lineman, insulated from the tower by a wooden ladder or platform, attempts to touch the tower. A spark-over occurs and body charge flows. Instantaneous current is very high during this discharge but its duration is short. With each cycle, 60 times a second, a high-intensity discharge occurs which is quite uncomfortable physically.

### Test Program

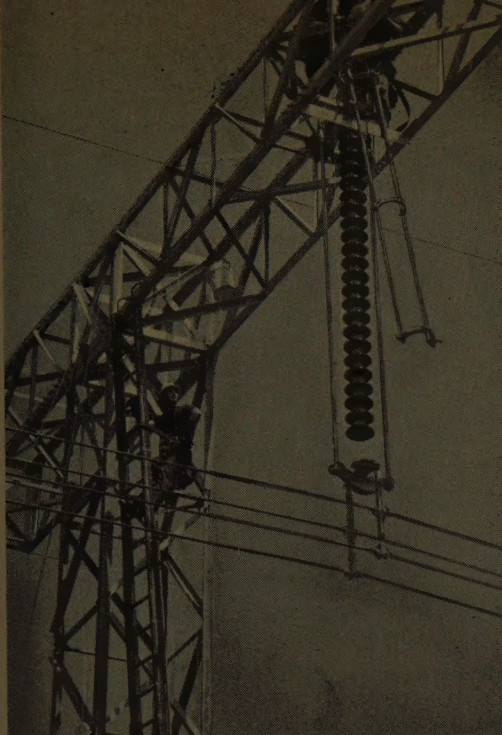
In 1959 tests were performed to

extend voltage and discharge current data into the 460-kv range. Equipment was then made up to reduce effects of the EHV field. Recent tests, therefore, were to ascertain whether or not the new methods and equipment would provide desired results, and to use specially-designed tools on the energized circuit to prove the practicability of doing live-line work on 460 kv.

Since the test line at Coldwater utilized wood structures for support, it was first necessary to erect a steel tower from which to work, and to suspend the four-conductor bundles from standard insulator strings.

To provide a basis for comparison, previous tests were repeated from a wood platform installed near conductor level





Cradle is lowered beside insulator string which is now disconnected from conductor hardware.



Cradle, supporting insulator string, is swung in arc up to tower arm where replacement or cleaning can be accomplished with comparative ease.

Linemen holding leads of an electrostatic voltmeter, then a microammeter, stood at vary distances from the conductor. Body potential in the field and leakage current when grounded were recorded. Linemen were then provided with conducting shoes and placed on a platform covered with a grounded metallic grid. Finally, to test its effectiveness, a shielded suit of coveralls was provided which, theoretically, placed a Faraday cage around the lineman and removed him from the electrostatic field.

It was evident that the linemen were removed from any noticeable discomfort when wearing conducting shoes on metal platforms. Although metallized suits offered some improvement, they were somewhat bulky to wear and it was decided to proceed without them.

Limiting the approach of linemen when undertaking live-line work was another necessary decision. Distance had to be great enough to completely safeguard against surge voltage flashover, great enough to limit to a comfortable level bodily leakage to ground, but not too great to hamper practical work with tools. Considering all of these factors, a distance of 12 feet was imposed as a the minimum approach

of a lineman to the live conductor.

### The Live-line Work

Since one of the most frequent maintenance jobs on tower lines is replacement of broken or defective insulators, this was the job selected for the first trial. Inherently, this work is similar to live-line replacement of a 230-kv insulator. However, a 230-kv insulator string is made up of 14 units weighing somewhat more than 10 lb each while a 460-kv string has at least 22 units making a string 10½ feet long weighing around 250 lb. Rigging necessary to handle such a string, of course, is more complex.

The conductors were raised slightly by means of adjustable insulated sticks hung from above. Then, the insulator string was disconnected from the conductor hardware and swung up to the tower arm for the replacement operation. Two sticks were used; these were suspended from a fitting on the tower which allowed up and down adjustment by means of a threaded upper fitting and two ratchet wrenches. Lower ends of the sticks accommodated a metal yoke which went under the conductor hardware and lifted the conductor bundle.

When the strain was removed from the joint between insulators and conductor hardware, the hardware was disengaged using a live-line hand tool. Then a cradle of equal length to the insulator string was placed beside the string and its lower end grasped by a live-line tool. The lower end of the cradle was raised in an arc until it and the insulator string was suspended directly below the tower arm. Any or all of the insulators could then be disengaged and replaced. The string could then be lowered, reconnected, and all tools removed.

Linemen generally worked from within the framework of the tower arm above the conductor except for one man who worked from a metallized ladder suspended 12 feet from the conductor. This man used the hand tool to disengage and engage the lower end of the insulator string.

The two weeks of testing and trial work at Coldwater has effectively proved that live-line maintenance can and will be performed on 460-kv lines when they go into operation in the Ontario Hydro transmission network, and will, as in other voltages, contribute much to the reliable, uninterrupted flow of power to customers.



# EPOXY RESIN REPAIRS SAVE PUMP DIFFUSER SECTION \$

*Sea water and its associated debris are having a hard time corroding and eroding epoxy-coated condenser equipment.*

By STANLEY ROGERS  
Maintenance Foreman,  
Silver Gate Station,  
San Diego Gas and Electric Co.

OVER a four-year period, the diffuser sections of the eight vertical-type centrifugal water pumps at the Silver Gate steam-electric plant have been repaired with epoxy resin putty and glass cloth/liquid epoxy laminates. The first repair of the bronze diffuser vanes and bronze housing adjacent to the vanes was made in May 1956, the eighth in April 1958. Apart from some localized minor wear of the resin, which is easily repaired during the biennial pump overhaul schedule, the overall results have been excellent.

For about \$100 per pump, including materials and two men's labor for half a day, this maintenance method has enabled us to salvage bronze castings whose replacement costs range from \$1000 to \$2500 each.

The former combined erosion/corrosion as in Fig. 1, was caused by unusually severe conditions. The eight pumps, varying in capacity from 15,000 to 20,000 gpm at 19-ft T.D.H., move sea water from the bay through the condensers and back into the bay.

Operation is continuous except for downtime during overhaul periods. The pumps consist of the suction area, impeller section, diffuser straightening vane area and column discharging to the condensers. Materials include a bronze body, a Monel shaft and a cast stainless steel impeller.

The sea water brings with it an intake of debris—small pieces of wood, shells, sand, and kelp—through the

screen and the pumps. In time, the combination caused considerable erosion/corrosion of the leading inlet edges of the bronze straightening vanes where the cast stainless steel impeller discharges into the straightener section. Prior to the epoxy repair, these edges became jagged and saw-toothed while the casting itself eroded to a dangerous level. In the cast bronze suction bell there was excessive damage where the sealing ring of the impeller meets the casing sealing ring.

Attempts were made to repair the deteriorated vanes by welding, but the results were unsatisfactory. Various other methods of repair were tried, with varying degrees of success. These include spray metal coatings, rubber compounds, neoprene and ceramics.

In 1956, at the recommendation of the Narmco Resins & Coatings Co., Costa Mesa, California, the first pump was repaired with the epoxy materials. Narmco 3119 epoxy putty (based on Shell Chemical Co.'s Epon® 834 resin) was used to build up the deeply pitted and excessively worn areas; Narmco 3135 resin (based on Epon 828) was reinforced with layers of glass cloth to completely cover all worn bronze surfaces of the pumps. Both epoxy materials are two-component systems which require the mixing of resin and hardener just before use. Their workable life is several hours. They harden overnight at ambient air temperatures, but curing can be speeded up by applying a flameless heat source such as infra-red or photoflood lamps.

## Application Technique

Since the bond strength of epoxy compounds depends to a large extent upon surface cleanliness, all eroded areas were sandblasted to bright metal and then blown down to remove grit and dust. The epoxy putty was applied with a spatula to fill the voids and to build up both the eroded fillet at the base plate and also the interior walls of the diffuser housing, as in Figs. 2 and 3. After two hours at a temperature of 75F, the putty had set firm enough to permit overlaying with the glass cloth.

All surfaces to be repaired were liberally brush-coated with the





Fig. 1—Abrasive debris plus chemical and electrolytic attack caused this typical erosion-corrosion damage to pump diffuser vane.

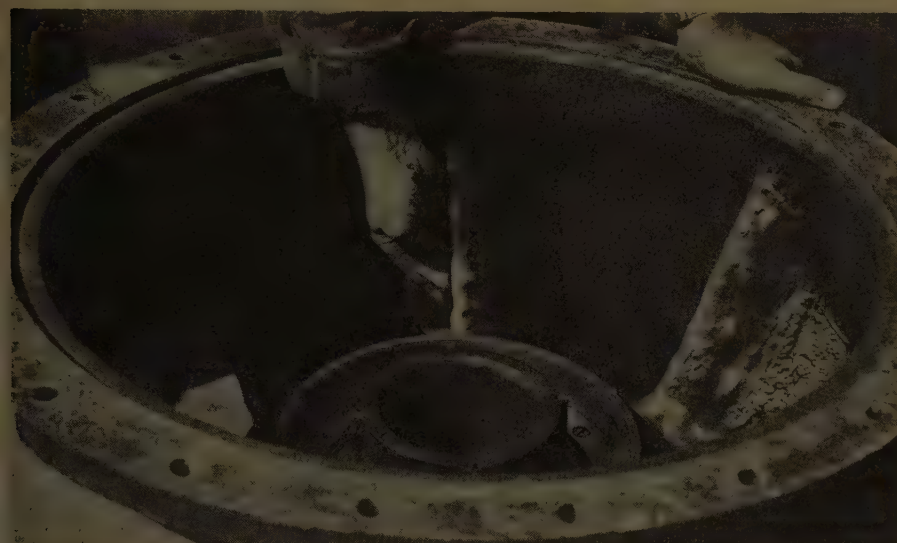
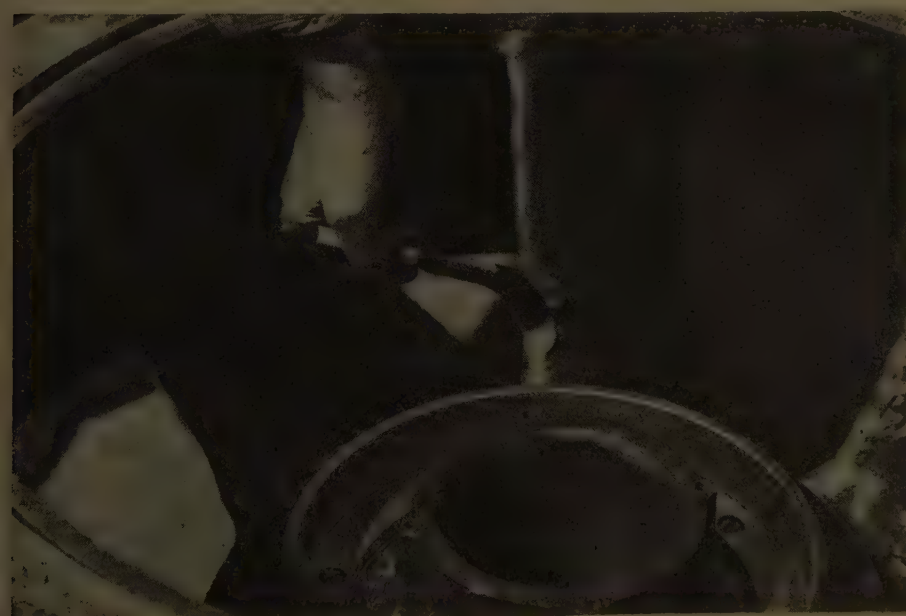


Fig. 2—Diffuser vanes and walls covered with epoxy resin and glass cloth are still unaffected after two years of daily service. To fix slightly worn spots, worker first sands area.

Fig. 3—Resin is mixed with hardener and the mixture is brushed over sanded area. This is the sole extent of maintenance. Tough, flexible resin hardens by the time the pump is reassembled.



liquid resin and a layer of eight-oz chrome treated glass cloth was pressed into the resin. This was followed by four additional layers of the same cloth, each thoroughly saturated with the resin. Care was taken to ensure complete coverage of the cloth with resin to avoid "starved" areas which could affect the ultimate strength and wear resistance of the repair. The laminate covered the outer edges and both sides of the vanes, the walls of the suction bell and the diffuser section itself. Because this resin cures with a certain degree of flexibility, debris from the sea water intake tends to rebound off the surface, rather than score or abrade it.

Another type of repair concerns the formation of large voids in the wearing rings of the pump castings. To fill these voids and also to streamline the water flow somewhat, laminates an inch or more thick have been laid up in similar fashion in these cavities of various shapes and diameters. To do this, glass fiber mat is cut into suitable sized strips which are overlaid and resin-impregnated until the desired build-up thickness is achieved.

When the initial repairs were made, it was thought that vacuum treating was required to eliminate air bubbles and ensure a tighter, denser, more-adherent coating. However, this was not found to be necessary.

At Silver Gate, repairs with epoxy resin and glass cloth have been made in other areas. The cast iron condenser water boxes into which the sea water is pumped were seriously corroded and pitted. One water-side pit was about one-in. deep and three-in. long. This was filled with the epoxy putty and overlaid with glass cloth and resin.

Generally, successfully bonding glass cloth to an old cast iron surface is a problem because of the difficulty in sandblasting to clean metal. However, strong epoxy repairs have been made on the condenser water boxes except in those cases where the metal had become badly graphitized. It would appear that if new cast-iron water boxes were factory-treated with epoxy resin and glass cloth, they would last indefinitely and require only occasional touch-ups with the liquid resin to fix worn spots.



# HOW 300-KV SUBMARINE CABLES WERE LAID ACROSS THE OSLOFJORD

*Here are the essential details of the recent installation of 300-kv a-c submarine cables under the Oslofjord. The authors reveal the engineering planning, reasoning, and thinking behind this unique and unusual project.*

By C. W. HIRSCH, Chief Cable Engineer, Standard Telefon og Kabelfabrik A/S  
and DR. JUST K. QVIGSTAD, Chief Engineer, A/S Hafslund, Norway.

IN THE SUMMER of 1959, four 300-kv a-c submarine cables were laid across the Oslofjord in Norway. They formed a solid link for exchange of power between the networks on both sides of the Oslofjord. It was built for the Hafslund power companies and will be owned by the Norwegian Water course and Electricity Board.

The possibility of an overhead line across the fjord was considered, but had to be rejected, since it would involve great danger for aircraft along the fjord. The submarine cable alternative was chosen, and the manufacturing and laying of the cables were undertaken by the Norwegian Company Standard Telefon og Kabelfabrik A/S, Oslo.

## Cable Crossing Location

The site of the cable link had to be chosen taking into account the length of the crossing as well as the possibility of cable damage from anchoring vessels. A careful examination of the possible landing points and a hydrographic study of the routes between them were made. The most advantageous conditions were found in a narrow and comparatively deep part of the fjord about 25 miles south of Oslo. The length of the crossing here is 5742 ft from shore to shore. The maxi-

mum depth of the seabed is 720 ft. A longitudinal section of the seabed along the route is shown in Fig. 1. In this narrow passage of the fjord uncontrolled anchoring probably will not occur, especially because the depth makes anchoring here inadequate.

When measuring the depth of water by echo sounder, a rather fuzzy record reading was obtained, indicating a soft seabed very suitable for cable laying.

Above sea level the terrain on both sides of the fjord consists of rock and rises very steeply from the shore. The shoreward approach is favorable at the landing points. At the east landing site the seabed consists partly of smooth rocky slopes, partly of clay and gravel. On the west side, the seabed consists mainly of gravel and clay.

## Choosing the Cable

Serving as a link in a 300-kv transmission system with solid grounded neutral, the cables to be used had to meet the I. E. C. recommendations regarding insulation level and other qualities. In order to avoid underwater joints, the cables had to be manufactured in a continuous length of nearly 6890 ft including short lengths for testing purposes.

Two main types of cables were considered, the gas compression cable and the oil pressure cable. A

compression cable turned out to be the most expensive in this case. Consequently, it was decided to use oil pressure type cables.

## Load Carrying Capacity

As the maximum permissible current of the 35-mile long overhead section of the transmission is 1100-1300 amp, depending on the ambient air temperature, the cable link had to be designed for carrying a corresponding load. This was obtained by using six single-core cables divided in three groups, each consisting of two cables in parallel. Each cable has a rated current of 700 amp. Consequently the total rated current of the cable link will be 1400 amp, thus insuring full utilization of the transmission capacity of the overhead line.

For the present only four cables have been laid, one of them serving as a spare cable. Hence, the transmission capacity initially is limited to 700 amp. By increasing power transmission demand, the cable link when needed will be completed by laying the two remaining cables.

## Ambient Temperature and Cooling Conditions

It was assumed the cables would not be exposed directly to sun radiation. The ambient air and water temperatures to be expected were derived from existing observation materials and turned out to be as follows:

The maximum air temperature was assumed to be 30 C and the minimum air temperature -25 C. The water temperature varies within wide limits depending on the depth. At the surface the water temperature in summer may reach 25 C. However, the maximum temperature at a depth of six ft will probably not exceed 15 C. At greater depths, below 330 ft, the temperature will be a constant six C regardless of the season. In exceptionally severe winters the surface water temperature may fall to about zero C, the fjord being covered by drift-ice.

The load carrying capacity of the cable link depends on the cooling conditions. The great difference between air and water temperature in the summer season raises the problem of how to take advantage of the

Editor's Note: This article was adapted from a paper presented by the authors at the 1960 CIGRE Meeting in Paris.



load carrying capacity under water without overloading the cable above water. Various methods were considered. One of them was to remove the steel wire armoring of the cable above water to reduce the losses on this section. There might, however, be some objections to diminishing the protection of the cable in this way. Another method was to provide some kind of water cooling for the cable section in question. At the time being, however, the load of the transmission link will be rather moderate in the summer season, when the flow in the river Glomma is abundant, giving maximum output of the power plants east of the Oslofjord. Under these conditions the problem was solved satisfactorily by leading the cable shore ends through a self-ventilated concrete tunnel running from the low water mark up the steep slope to the terminals at both landing sites.

### Type of Armoring

Various types of armoring were considered. Because of the depth at which the cable would be laid it was obvious that it would be subject to heavy stresses during the laying depending on the weight of the cable. The possibility of diminishing the weight and the stresses by using a wire armoring of some salt water resistant aluminum alloy was considered. The salt contents of the water at great depth are 3.4 percent, but at the surface the contents sometimes are only 1.5 percent. Lack of experience in this field made us decide to use a galvanized steel wire armoring. In order to balance torsional forces the armoring was made of two layers of wires, the one applied in a direction opposite to that of the other.

### Cable Design

After considering the above conditions, the cable was constructed as shown in Fig. 2. The dimensions are as follows:

Oil duct diameter.....	.555 in.
Copper conductor .....	0.62 sq in.
diameter .....	1.18 in.
C. B.-paper; Paper insulation .....	850 mils
C. B.-paper; Lead sheath (Arsen-alloy) .....	166 mils
diameter .....	3.3 in.
Reinforcing tape	

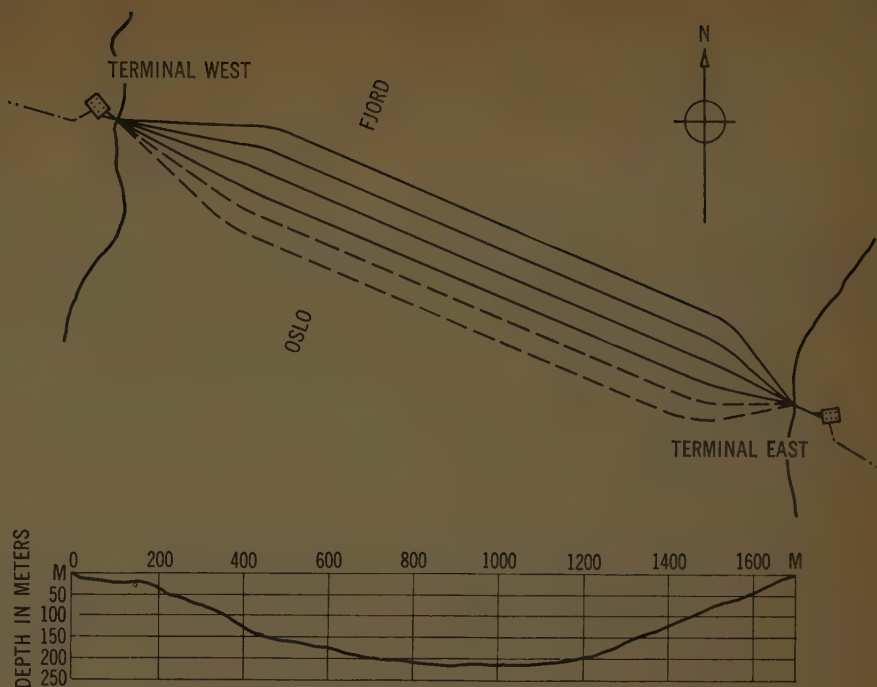


Fig. 1—Cable route and longitudinal section.

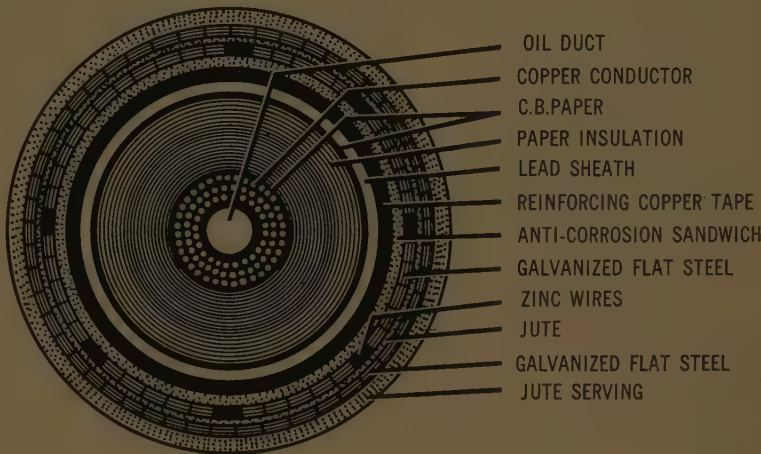


Fig. 2—Cross section of the cable.

Fig. 3—The first cable end is brought ashore.





# 300-KV Submarine Cable

tinned copper .....	2 x 8 mils
Anti corrosion sandwich .....	3.5 mm
Bitumen/polyethylene/jute	
Double armor galvanized flat steel and zinc wires .....	2 x 100 mils
Outside double jute serving .....	180 mils
Outside diameter .....	4.41 in.
Weight .....	25 lb. per ft
In the inner layer of armoring wires, 8 steel wires were replaced by zinc wires to reduce the armor-ing losses.	
Manufacturing length (without joints) .....	6900 ft
Number of lengths.....	4

## Losses and Temperatures

The calculated loading capacity of the cable is based upon calculated losses and the cooling conditions. After insulation the cables were load tested as described below. For the calculation of losses it is pre-

supposed that the cables are laid in the sea bottom at intervals of 164 ft and on shore (from the shore up to the terminals) in a duct at a distance of one ft. Maximum load in winter time is expected to be 700 amp, and the conductor temperature rise at this load was calculated to be:

30 C	At sea,
	water temperature, 10 C;
57 C	On shore,
	air temperature, 0 C

After installation the cables were tested on losses and temperature rise at different loads up to 1000 amp in the copper conductor.

The far end conductors at Filtvet (Terminal West) were short-connected and the losses (volts, amperes and watts) measured at Brenntangen (Terminal East). The lead sheaths and armoring wires were short circuited and grounded at both ends. The three-phase power was supplied from a generator at the water power station at Kykkelsrud, located about 25 miles away.

At a load of approximately 700 amp in the conductors for about six hr the temperature had stabilized, and the voltages, currents and losses were measured in the cables.

As the cables are laid in flat formation, the reactances of the cables are not quite equal.

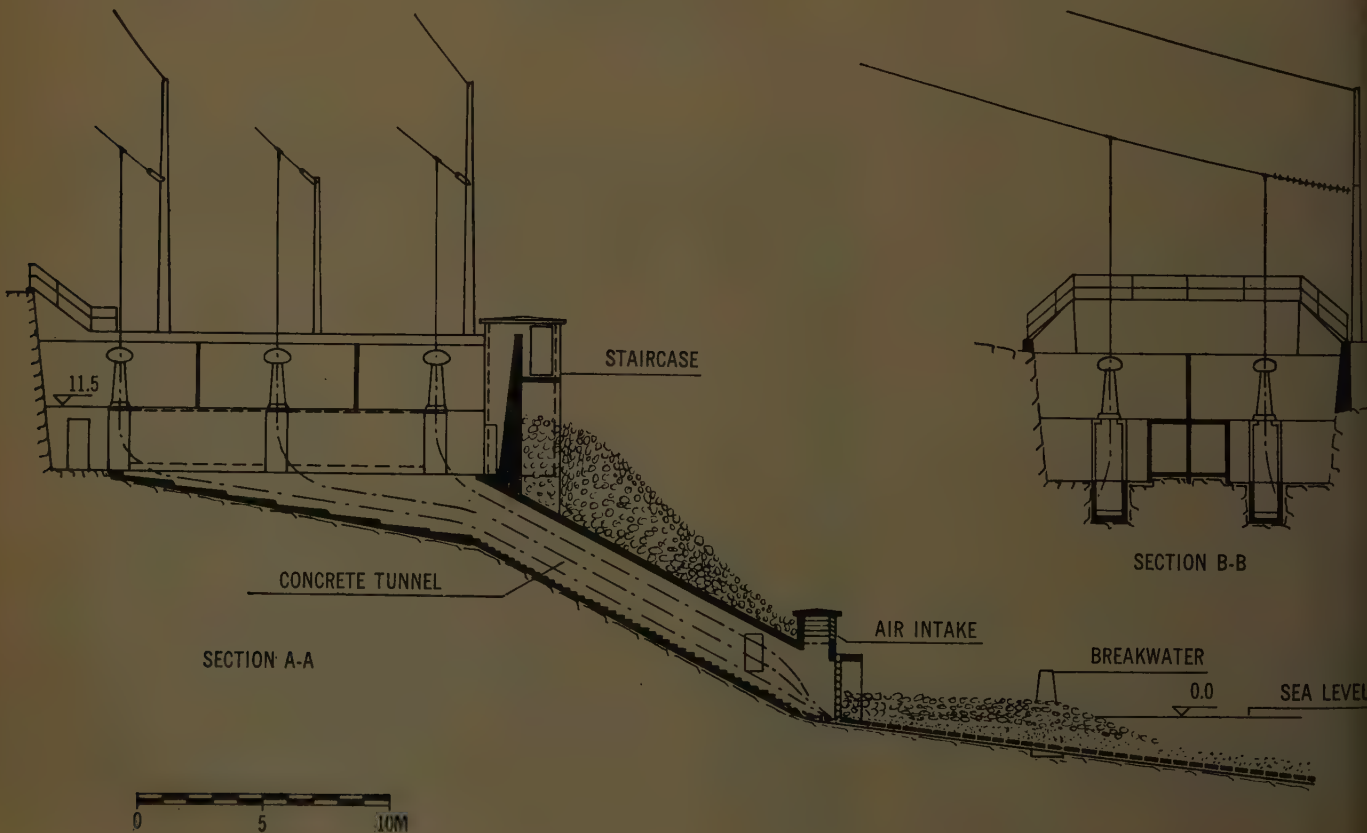
The differences are, however, rather small, because the distances between the cables are as much as 164 ft. Each cable acts more or less as if it is isolated and not much influenced by the magnetic field of the other cables.

## Transport and Installation

The transport basket was moved to the harbor of Oslo by means of a trailer. The diameter of the basket is 20 ft, and the transport through the most congested parts of Oslo had to be carried out at night between midnight and five am. At the harbor, the basket was lifted on board the cable ship "Stanelco" by means of a 100 ton crane. The basket was placed on deck mounted on a rack equipped with a wheel flange.

During the laying process, the basket rotated. The cable ship was

Fig. 4—Cross section of protection structures.





linked to a sister ship of approximately the same size, to improve the stability.

From the harbor of Oslo the cable was transported to Filtvet, a distance of 25 miles, and the cable was laid across the fjord. "Stanelco" is specially equipped for the laying of high voltage cables where the bending diameters are much larger than those required for telephone cables. The wheel of the braking capstan has a diameter of 10 ft and can brake the cable with a pull of 10 tons.

The capstan is electrically operated. From the braking capstan the cable passes a dynamometer for tension control, and is laid in the water over a slipway in the bow with a bending radius of five ft. The ship is equipped with fathometer and radar and is reinforced in the bow to make it possible to go close up to the shore. This makes it much easier to bring the cable ends ashore.

At the cable laying of the 300-kv cable, the first cable end was taken ashore by means of a winch,

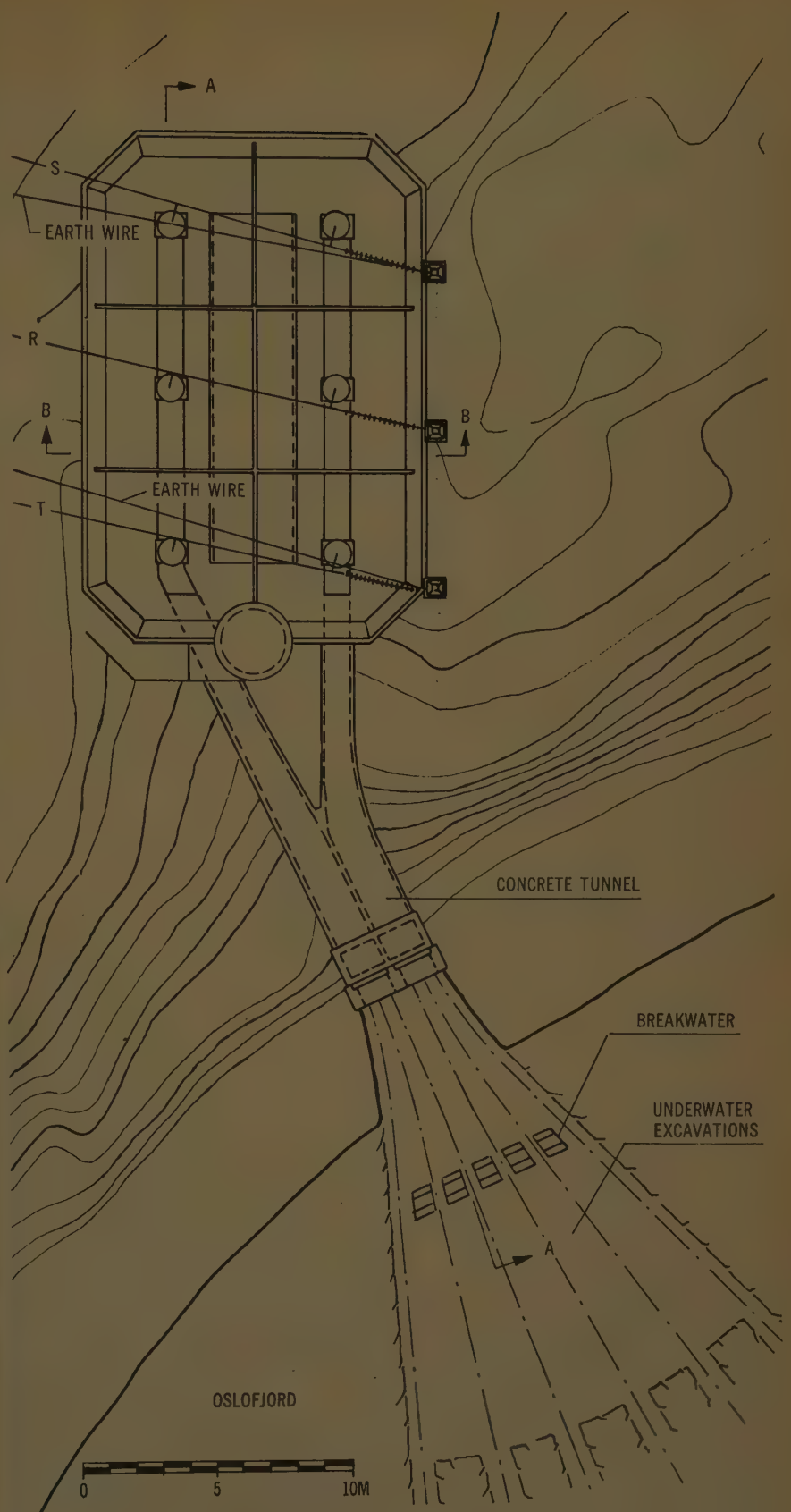


Fig. 5—Plan view of the landing site.



Fig. 6—Cable terminals are mounted on high concrete supports to prevent being covered up by drifting snow accumulating in the pit.



## 300-KV Submarine Cable

mounted at the same level as the sealing end. After being fixed with anchor-clamps, the cable was dropped in the sea-bottom in trenches, prepared beforehand, to a depth of 33 to 39 ft.

The operation was directed by frog-men, equipped with telephones. During this work, the ship had been maneuvered by means of tow ropes to the shore and to buoys until the ship was in position for the fjord crossing. (Fig. 3.)

The fjord crossing lasted about 1½ hr. The maximum depth was 720 ft, and the corresponding tension of the cable applied by the braking capstan was about eight tons. During the crossing the cable ship was assisted by some tugboats, as the sea current can be rather heavy. When the cable is laid out, the basket rotates and the cable cannot twist.

The position of the ship, the depth, the quantity of cable paid out, and the tension and laying angle of the cable were continuously controlled.

After the crossing of the fjord had been completed, the ship was moved to the shore more or less as on the

first side, and the cable dropped in the trench. When the ship was close up to the shore, the cable loop was laid ashore provisionally placed on a sloping slip way made of deal boards. The cable was cut at the accurate length, soldered and pulled up to the sealing end by means of a winch.

### Cable Terminal Protection

As mentioned previously steep rocky slopes rise from the shore at the landing points on both sides of the fjord. These slopes are exposed to the surge of the sea and to ice drifting along the shore. Precautions therefore had to be taken to prevent any movement of the cables at the shore section and to protect them against any kind of external damage. The sealing ends and their porcelain insulators had to be protected against stone-throw and sea-spray.

At each landing site, excavations were made below as well as above water. Later a concrete tunnel was constructed running from low water mark up to a pit excavated in rock, where the sealed ends of the cables

were located, thus giving a semi-underground structure for the cable terminals. The tunnel and the pit are divided lengthwise in two sections, continuously separated from each other by concrete walls. Each section provides space for three single core cables mounted, one above the other, on shelves along the tunnel wall, and for the corresponding sealed ends mounted on high concrete supports to prevent them from being covered up by drifting snow accumulating in the pit. At the lower end of the tunnel an air intake provides the necessary ventilation insuring a reasonable ambient temperature of the cables.

On the sea side of the tunnel underwater trenches have been excavated, one for each cable, extending offshore to a depth of 33-39 ft. After the cables had been laid in trenches and embedded in sand, they were covered with concrete slabs and the trenches filled up with gravel and clay from the seabed.

At a distance of about 33 ft offshore, a concrete breakwater was constructed, and the space inside it filled with heavy stones upon a thick layer of sand to protect the cables against the surge of the sea and against drift-ice. Stop logs prevent the stone masses from entering the tunnel.

Fig. 7—Air intake and cable terminal structures seen from the water side.



Fig. 8—Air view of cable terminal pit.





## Low Cost Ladder Truck Reduces Maintenance Time

By A. BURK, Maintenance Foreman  
and G. TOWNSEND, Maintenance Man, Muskingum River Plant  
Ohio Power Co.  
Beverly, Ohio  
AEP System

For occasional work, the installation of permanent supports for a 28-ft extension ladder on a switch yard truck has provided a safer and less time-consuming method for changing street lights at the plant.

In addition to changing lamps, this improvement is used to inspect and lubricate 138-kv and 345-kv disconnects, to inspect 345-kv bushings, and for Doble-test work on high equipment. For this general use throughout our station, we estimate that the arrangement saves several hundred manhours annually. Total cost was only \$50, exclusive of the ladder.

Prior to using this idea, lamps were changed from a 36-ft ladder which rested on the ground. The top of the ladder was placed against the lighting fixture arm, and this resulted in a shaky arrangement at best. Transporting and erecting the ladder had proved excessively time-consuming. Now, these disadvantages have been eliminated; the ladder is more rigid and is readily transported and erected in a fraction of the time previously required. In fact, setting up the ladder now takes two men only 5 min. This in-



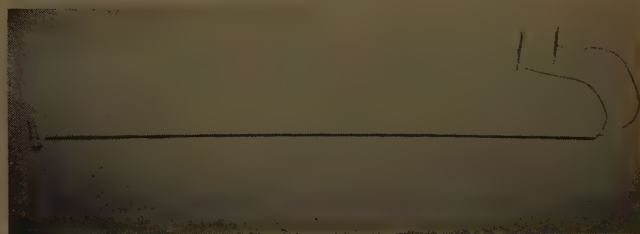
Ladder truck versatility can be had at a fraction of the cost, using an ordinary service truck. Ladder supports and guying cost only \$50 but new facility saves several hundred manhours annually.

stallation includes two wells on the truck bed for the ladder feet and two guide brackets on the cross member added to the truck. In addition, the ladder top is steadied by two adjustable guy ropes tied to the front end of the truck.

The cross-bracing was made from standard 1½-in. pipe and fittings. The wells for the ladder feet were made from ¼-in. thick steel plate and bolted to the metal truck bed. Two ½-in. ropes are used to guy the ladder. These are tied securely to two eyebolts, one fastened to each end of the front bumper. The guy ropes can be adjusted by pulling them tighter through the eyebolts and retying. Other means could be used to tighten the guy ropes, but this method has proved satisfactory during our 14-months' experience.

## Simple Tool Starts Inaccessible Bolts

By LAWRENCE OCHS, Maintenance Man  
Tanners Creek Plant  
Indiana & Michigan Electric Co.  
Lawrenceburg, Ind.  
AEP System



Bolt holder can be made in minutes from a piece of tubing. Both cords are held to pull bolt against end of tubing; as bolt is positioned in hard-to-reach location, cords are manipulated to turn bolt. Once threads are engaged, a wrench can be used to tighten bolt. Idea has many applications.

This string-and-tubing device has helped start bolts in inaccessible locations, thus saving many man-hours and frustrating experiences.

In the normal course of work, maintenance men and mechanics spend considerable time trying to start bolts in drilled and tapped holes in parts of turbines and other equipment where the holes are inaccessible. Often these locations prevent holding the bolt so it can be positioned and started. One problem, for example, has been the flange bolts on the deflector adjacent to the steam seal on a turbine.

To solve this problem, a piece of copper tubing (½-in. or smaller) was cut long enough to allow easy access to the bolt hole. A strong cord was doubled and dropped through the tubing, then wrapped twice around the bolt. By holding the ends of the cord tightly the bolt can be pulled firmly against the tubing and then placed in position to be screwed into the hole. To thread the bolt into the tapped hole, a pull on the proper string end will turn it in the right direction. The bolt can then be tightened with an ordinary box or crescent wrench.





### Severest Tests of our Lives Coming Don Mitchell Tells AIEE Winter Meeting

"The next several years will put us to the severest tests of our lives. But the brilliant past history of the electrical industry tells me that there isn't a roadblock that all of us can't overcome if we go after it," Don G. Mitchell, president, General Telephone & Electronics Corp. told the Winter General Meeting of the American Institute of Electrical Engineers. He outlined steps which should be taken to assure a favorable business climate for everybody. They include the following:

1. Place greatly increased emphasis on research and development—innovation and invention.

2. Assure far greater automation and mechanization of both manufacturing and administration processes. "By projecting our existing growth rates into the future, we see that automation will have to fill 20 million job vacancies in the next 20 years, because there won't be enough people available for the working force to produce the goods and services our country will need," he said.

3. Adapt our operations more effectively to our existing and potential markets—world-wide markets require a world-wide viewpoint.

He left the group with a warning: "If management fails to apportion the benefits of greater productivity on a fair-sharing basis among

shareowners, employees and customers; if labor takes all of the productivity increases in the form of higher wages, if government keeps increasing the tax load without making sure that it has first eliminated waste and extravagance of its present tax revenues—there won't be anything left for anybody."

#### "Clarify Your Goals"—Dr. Osborne

The engineering leaders were urged to "crystallize a clear statement" of the goals of unity of the profession by Dr. Harold S. Osborne, former chief engineer, American Telephone & Telegraph Co. In accepting the Edison Medal he suggested that "particular attention be given to expressing what goals related to its public responsibilities the profession should seek to achieve. In their deliberations the leaders should fully take into account the explosive character of our era, both technically and socially . . . study the question in its full breadth and depth," and "consider the problem in its long range aspects, as well as in the light of conditions today."

Practically every facet of the electric industry was covered by technical sessions during the meeting in New York from January 30 to February 3. Excerpts from utility industry sessions mark continued technological progress.

Relationships between radio influence, corona losses and the weather on the two test lines at Ontario Hydro's Coldwater Project were brought out by several Hydro authors and United States utility-manufacturer discussors during the subject session.

Hydro's J. Reichman and J. R. Leslie found that conductor gradients on four-conductor bundle lines of 20 kv rms/cm result in satisfactory RI levels, and concluded that positive polarity corona generation alone appears to be responsible for RI from ehv conductors. A discussion paper by Dr. Charles Mathen of Ohio Brass (presented by Jack Tyler) averred that uncleaned conductors will exhibit positive polarity "blooms" while cleaned conductors exhibit only negative polarity corona. He stated that positive polarity blooms generate ten times more RI than do negative. His discussion also agreed with the authors' that standard suspension insulators are suitable for use at voltages up to 600 kv.

There seemed to be general agreement that the modes of propagation of radio frequency energy on test lines appear to differ quantitatively from those on long lines.

O. Nigol and J. G. Cassan, both of Ontario Hydro described a new method for determining coronal losses of bundled-conductor transmission lines in various weather conditions, using experimental data and accurate measurements of precipitation rates. Fair-weather losses are shown by the Coldwater tests to be completely negligible



AIEE President, C. H. Linder, General Electric Co., addresses General Session of AIEE Winter General Meeting. Left to right at speaker's table are: R. M. Franklin, Sperry Gyroscope Co., Chairman of AIEE N. Y. Section; C. M. Mapes, AT&T Co.; H. I. Romnes, AT&T Co.; Dr. Harold

S. Osborne, Consulting Engineer; Mr. Linder; R. W. Gillette, Con Edison, General Chairman of Meeting; M. J. Kelly, Bell Telephone Laboratories; S. R. Warren, Jr., Univ. of Pennsylvania; L. F. Kennedy, General Electric Co.; and Professor R. T. Weil, Jr., Manhattan College.



as an economic factor, within the usual operating range of conductor surface gradients. Significant losses are experienced, apparently, only when surface conditions are grossly affected as by the deposition of water droplets or snowflakes thereon, they said. Surface ageing—while important to RI, seemed unimportant as far as corona losses are concerned, they concluded.

The system of corona loss measurement at Coldwater, said Hydro's J. M. Vanderleck, has been designed and operated with an estimated accuracy of  $\pm 0.5$  kw/3-phase mile or of four percent of the loss, whichever is the greater. The system was calibrated by use of the test line itself when operating under conditions of insignificant corona losses. An instrument for recording very small amounts of rainfall and snowfall was used to measure rates with an accuracy of at least  $\pm 0.006$  in. per hour of rain or  $\pm 0.06$  in. per hour of snow.

### Substations and Equipment

From analysis of lightning surge voltages which may impinge on an open breaker, it is proposed by C. F. Wagner and A. R. Hileman of Westinghouse Electric Corp. that the short time impulse insulation strength of power circuit breakers be proven by application of a  $1\frac{1}{2} \times 40$  microsecond surge chopped at 2 microseconds whose magnitude is equal to 1.37 times the breaker BIL. Some examples from a table supplied by the authors: for 345 kv this value is 1780 kv, for 230 kv, 1230 kv, and on the other end of the voltage picture for 14.4 kv, 150 kv.

They recommended that a rod gap be placed on the line side of the breaker whose spacing is coordinated with the breaker BIL. The gap should be placed close to the breaker but far enough away that any 60-cycle arc will not be blown into the bushing.

"The addition of a number of grading rings on insulators within the substation or on towers just outside of the station either on insulator strings or insulator stacks is also beneficial in reducing the severity of the surge," the authors said.

Factors to consider in the selec-

tion of substation sites were presented by W. A. Conklin, Consumers Power. Included in suggestions he made are the following: (1) Do not abandon a site on the basis of the line exit arrangement that can be accomplished and keep the number of exit poles to a minimum. (2) An attempt should be made to get an "Essential Services Clause" incorporated in zoning ordinances which do not have such a clause. (3) Purchase transmission substation sites five years in advance and distribution sites two to three years in advance of construction to insure availability when needed. (4) Weigh the noise consideration carefully and obtain a minimum 60 to 80 ft separation between the transformer and residence if possible. Separation of 100 ft is recommended if a 10,000 kva transformer is to be used. Main thoroughfares have a higher ambient noise level which will allow a higher tolerable level.

Utilization of substation transformer losses to heat its adjoining building is one of the unique design features of Quebec Hydro-Electric Commission's 240-mva underground substation in Montreal. The building's heat demand is of the same magnitude as the heat losses from the transformers, according to a paper by Quebec Hydro's P. L. Ward, J. Pauze, L. D'Auteuil and A. Gaudette.

The substation and the office building are not interdependent.

Temporary divorcing the substation and building systems can accordingly be accomplished readily if circumstances so require.

Prior to construction, a watertight curtain was set up around the site by freezing. Twenty-one days were required to freeze the wall, 60-ft high and 3-ft thick, after which, the excavation could be started without fear of disturbing foundations of nearby buildings. To install the freezing pipe system, 400 holes, 60-ft deep, at three-ft centers, had to be bored with three-in. diameter diamond drills. In these holes, situated outside of the 20-in. piles, were inserted double wall pipes made of  $1\frac{1}{4}$ -in. inside of  $2\frac{1}{2}$ -in. diameter pipes, for circulation of the cooling fluid. The fluid passes down the  $1\frac{1}{4}$ -in. pipes

and up in the  $2\frac{1}{2}$ -in. pipes back to the refrigeration plant.

### Switchgear

Consensus of engineers and operating people attending a switchgear session was favorable toward single-tank oil breakers. The trend to single-tank oil breakers for subtransmission voltages was outlined by Earl B. Rietz, I-T-E Circuit Breaker Co., who described new single tank breakers by his company. The units have ratings up to 46 kv and interrupting times of less than five cycles.

The experience gained during I-T-E's development program strengthened the feeling that already existed, that single-tank breakers should supercede three-tank breakers to gain for the industry the many advantages already stated. It is the author's contention that the trend to single-tank breakers should not stop at 46 kv but be carried to higher voltages.

The bulk oil circuit breaker was considered as a simplified mechanical system in a study discussed by M. G. Mathers and P. Wildi, both of Federal Pacific Electric Co.

The study showed that vertical tank acceleration is the major factor to be considered when analyzing the mechanical effects produced in oil circuit breakers by a high power fault interruption.

### Transformers

A new concept in a high voltage underground residential electric system employing a separate surface mounted utilization transformer just outside each residence, was described by H. G. Hally, Iowa Power and Light. He said that the loss of diversity, and increased transformer capitalization created by this scheme are more than offset by the saving in secondary losses and wiring costs, plus vastly improved voltage regulation. The "utilization transformer" allows the utility to cater to the individual requirements of the customer and to make changes without disturbing the rest of the system, Hally asserted.

P. S. Pugh, American Electric Power Service Corp. and H. H. Wagner, Pennsylvania Transformer Div. of McGraw-Edison Co., pre-





Edison Medal is presented to AIEE Past President Dr. Harold S. Osborne (center), consulting engineer and retired chief engineer, AT&T Co. by AIEE President, C. H. Linder, vice-president, General Electric Co., as R. W. Gillette, senior engineer, Electrical Engineering Dept., Con Edison, chairman of the meeting's general committee, looks on.

sented a new and effective gas analyzing method for detecting low-energy incipient faults in power transformers having gas space above the insulating oil. This method permits gas samples to be taken without deenergizing or disturbing the operation of the transformer. When an incipient fault is indicated, an evaluation of its seriousness can be made and an outage predicted and planned, they said—thus greatly reducing damage to the transformer. Also, examination can be made before the evidence is destroyed by failure and therefore proper remedies more accurately determined, they added. H. E. Kelley, Goodyear Atomic Corp., commented that his company has adopted a policy of monthly monitoring the gas in its large power transformers using a combustible gas detector.

### Distribution Systems

After an area has once been established (houses built and modern appliances installed), demand does not increase in accordance with kwhr consumption unless there has been a push of sales of appliances such as water heaters, electric heating, or air conditioning. This was the finding of D. C. Achtenberg and A. E. Price, Detroit Edison, resulting from studies made of 13 transformers serving about 400 customers. If transformers are correctly sized originally, no more than one transformer replacement should be necessary because of de-

mand increase, they said. It is in error to assume that single distribution transformer load growth follows a compound interest type of curve, they emphasized.

### Multiple-Vs-Single Heat Pumps

Multiple heat pump installations have an operating cost advantage compared to one large central station system, declared R. D. Roley, General Electric Company. The annual demand charges are lower and only those units are operated that are actually needed. Although a number of small units will cost more than a single larger unit of the same total capacity, this equipment cost is only between 25 and 75 percent of the total job dollars, he said. In a very high percentage of cases, the savings in electrical services, duct work and piping will more than make up for the extra equipment dollars, Roley asserted.

### Selecting Precipitators

When purchasing a new precipitator, all the submitted designs should contain the same number of active bus sections before actual comparisons are made. This was the suggestion of R. G. Ramsdell, Jr., Con Edison. Mr. Ramsdell described the method developed by Con Edison for predicting the collection efficiency of a precipitator based on design and performance test data from 140 tests on 25 precipitators on its system. He said that this method may be very use-

ful to the electric power industry when comparing various precipitator designs.

### Differential Circuit Breakers

The miniature differential circuit breaker should be used as a service switch for the "safe home," the main circuit breaker on the distribution or lighting panel, and for branch circuit protection, where the highest possible degree of protection against line-to-ground short circuits is paramount, said Charles F. Dalziel, University of California. This type circuit breaker may provide a much higher level of safety than heretofore possible in areas where hazards of electric shock, fire, or explosion must be reduced as much as possible. These circuit breakers have been successfully used in Europe for a number of years, he asserted.

### Project EHV Towers

If 50 or more towers would be required, prestressed concrete towers should be competitive on a first-cost basis for towers of the size and type installed for Project EHV, in the opinion of S. D. Alpert, Stone & Webster Eng. Corp., and M. Schupack, Schupack & Zollman, structural engineers. Other type prestressed concrete towers can be developed which will also be competitive, they said.

Glued laminated wood can and will be the most economical solution to many of the utility tower construction problems for anticipated 460 to 750-kv transmission lines. This will be determined and proved both structurally and electrically during the Project EHV tests, according to J. J. La Forest, General Electric Co., and R. W. Stumbo, Jr., Rilco Laminated Products, Inc.

### CORRECTION

In the article "Short Range Peak Load Prediction . . ." by W. L. Carey, Planning Engineer, Portland General Electric Company, center column of page 46, February 15, 1961 issue of *EL&P*, the formula for the two-year prediction should have read as follows:

$$P = P_0(1 + r_2) - S_2(T - T_0) + Kf(x)$$



## Utility Buyers Discuss Orders, Materials, Stock

Invoice forms, small orders, vendor stocking, steel versus aluminum—these were some of the nuts-and-bolts matters reviewed in one session of the NAPA-PUBG mid-winter conference. A panel discussion incorporating remarks on these subjects was conducted by Moderator Wilton L. Brown, director of purchases for the Peoples Gas, Light & Coke Co. (An additional paper, by L. H. Moss on "Ethics in Purchasing," is reported on page 73 of the Mar. 15 issue of EL&P.)

Dissatisfaction and complaint with the form and content of "invoices" does exist from coast to coast, reported W. C. Allen, purchasing agent for the Utah P. & L. Co. He criticized vendors (but not all) and P. A.'s alike "for having allowed this vital point of contact between buyer and seller to deteriorate to its present state." He added:

"In this age of automating, mechanizing, streamlining and standardizing, paper works is being analyzed continuously by both vendors and customers in search of labor-saving processes. The difficulty arises when vendors make a change in their paper forms and procedures, but fail to consider the effect of their change on their customers. Perhaps when we purchasing agents make changes or short-cuts in our forms and processes, we also fail to consider what burden we may impose on our vendors. Thus, it looks like there has been a short-

circuit in communications.

"I believe the solution to our problems with 'invoices' lies in exposing our complaints to suppliers and by showing them examples of what we believe are the minimum requirements of an acceptable invoice, said Mr. Allen.

Louis R. Tomey, purchasing agent for the Union Elect. Co., described small order processing as "a lucrative field for improvement." He proposed discussions with suppliers concerning ways for reducing paper work in this area. One possibility: elimination of the confirming order.

D. J. Fitzgerald, purchasing agent for the Baltimore Gas & Elect. Co., reported these advantages from vendor stocking:

1. Reduction from a three month's supply to less than a one month's supply in the case of a substantial quantity of the Baltimore utility's central warehouse and service center's stocks.

2. Reduction of the utility's investment in these inventories by at least 70-percent, or about \$275,000 (including a reduction of \$130,000 in the investment in copper wire alone).

3. Gain in storage area in the utility's facilities—in the case of Baltimore G. & E. Co., about 20,000-sq ft.

4. Reduction in the cost of handling by eliminating movement of deliveries through the utility's central warehouse and delivering direct from vendor stock to the utility's service centers.

Although Mr. Fitzgerald conceded that additional costs are incurred by virtue of additional services rendered by the vendors

maintaining the local stocks, he said his company had yet to find a case where the vendor's costs exceeded the utility's. He surmised that this was due probably to the fact that the suppliers are, by long experience and for other reasons, better equipped than the utilities to do a stocking and distribution job.

Mr. Fitzgerald expressed the view that "the question of additional costs incurred by vendors in local stocking is not as serious as some people feel it to be."

Mr. Fitzgerald also reported that his company had broadened its concept of "local" to a point where "we do not insist that the stocking of all material be in our territory, although we still favor it, and generally include the requirement that overnight delivery be available.

"This extends the radius for many miles and often allows the supplier to use existing facilities instead of setting up additional warehousing. At least one of our suppliers now operates more than 100 warehouses throughout the United States," noted Mr. Fitzgerald. "It is interesting to speculate on the number of utilities which could draw on these warehouses, also, on an overnight delivery basis."

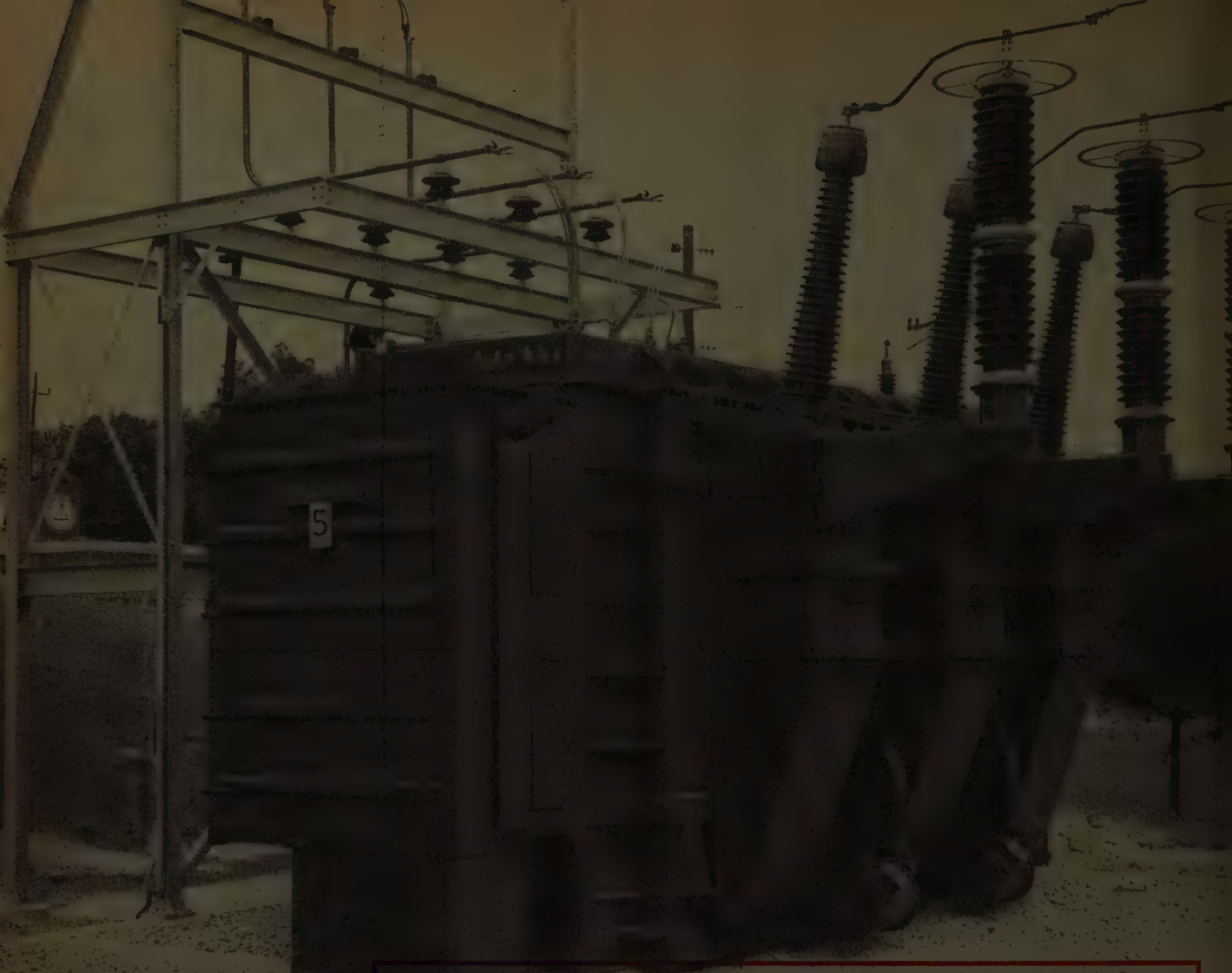
A. W. Fox, manager of purchases for the Puget Sound P. & L. Co., observed that, while numerous utilities are firmly entrenched in steel station programming, phenomenal progress and development has been made in the use of aluminum in relatively recent years. Where competition is keen, he noted, the aluminum industry is reported to be offering price concessions.

Panelists in a session on utility purchasing practices in the recent annual NAPA-PUBG conference included (l. to r.): D. J. Fitzgerald, A. W. Fox, L. R. Tomey, L. H. Moss and W. C. Allen. (Editor's note: With a photo

from this conference, published on page 72 of the March 15 issue of EL&P, a caption incorrectly identified Howard Woods of Toledo Edison as Harold McDonald of Detroit Edison.)







**100,000 KVA, LTC, HV 220,000 GRD. Y/127,000 VOLTS,  
LV 36,000 GRD. Y/20775 VOLTS, TV 13,800 VOLTS  $\Delta$  @ 35,000 KVA**

## **Power on the Potomac**

100 MVA, 220 KV, Moloney LTC Transformer installed at Potomac Electric Power Company's Takoma Substation #27. This unit was placed into service by PEPCO in 1960, ten years after they had installed Moloney's first LTC Transformer, a 3750 KVA unit. The design principles of Moloney LTC are still the same and have been proven by a decade of service. Two of the main principles of Moloney LTC are:

1. All arcing is confined to special arcing contacts on the load transfer switch greatly reducing maintenance of selector switch contacts.
2. The exclusive, patented, reactor by-pass arrangement eliminates reactor loss and reduces voltage drop on non-bridging positions.

For additional information on Moloney LTC equipment request Bulletin LTC 2907. Contact your local Moloney representative on all transformation requirements.

ME61-0



**MOLONEY ELECTRIC COMPANY**

*Manufacturers of Transformers for Utilities, Industry and Electronic Applications*

FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA





## MANUFACTURERS-PRODUCTS

### Uptegraff Introduces New Design 65° Distribution Transformer

A series of new "compact" pole-type distribution transformers, designed specifically for operation at 65°C temperature rise, have been developed by the R. E. Uptegraff Manufacturing Co. The transformers are the first in the industry specially designed for 65°C temperature rise and are not dual rated 55°/65°. The design features low ratio of full load copper loss to core loss, introduction of high temperature insulation, and a reduction in size compared to 55° rise transformers in the same ratings. According to the manufacturer, these innovations permit a reduction in price, more economical operation, and longer service life.

### Utilize Model To Study Reactor Coolant Conditions

A plastic model of a nuclear reactor system is being utilized by General Electric engineers to simulate actual coolant circulation conditions in a full-scale operating reactor.

The model, shown below, was constructed one-fifth the size of the nuclear system of the Consumers

GE engineers actually observe coolant circulation in a plastic model of Consumers Power Co. Big Rock Nuclear Station.



Power Co. Big Rock Point Nuclear station now under construction.

Plastic tubing is used in the scale model to permit APED engineers to actually observe the flow of air-water mixture which simulates actual reactor flow conditions. Data collected will be used as an aid in the design of the Consumers Power reactor, the first to utilize an improved nuclear core under GE development.



Street light encrusted in ice shown above was still operational when the ice was chipped off, despite the intense heat and cold water blasts suffered during a fire.

### Street Light Stands Up Under Torture Test

Nature provided a tough test for a street light in Elk River, Minn.—a test, incidentally, tougher than most lighting manufacturing engineers ever devised. During a recent fire, the fixture, a Westinghouse Mainstreeter, was subjected to intense heat and continuous blasts of cold water. Despite the rough treatment, the light continued to operate. The next day, after the excitement was over, all the line crews had to do to restore the street light to its former condition and efficiency was to chip off the ice that had formed by water from the firehoses.



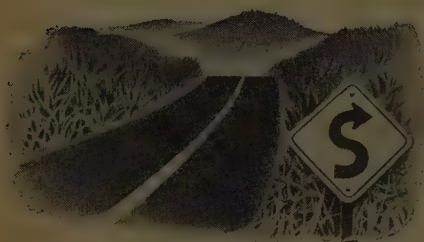
# AMCHEM, the makers of Weedone, can solve your brush problem...*whatever it is*

## LINE CLEARANCE



Turn brush-choked utility rights-of-way into brush-free areas quickly and economically with WEEDONE/WEEDAR brush control chemicals. Also now available—complete brush control programs through new "dormant cane broadcast spraying" techniques.

## ROADSIDE CLEARANCE



New AMIZINE Weed Killers and AMIZOL combinations provide complete vegetation control along thousands of miles of roadsides, center strips, embankments, guard rails, etc.

## RIGHT-OF-WAY CLEARANCE



Specialized Amchem techniques using WEEDONE/WEEDAR chemicals and AMIZINE/AMIZOL combinations provide high control, low cost chemical brush eradication programs for railroads.



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Please send me copies of your "Brush Control" brochure and full information on the uses of Weedone Brush Killers.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

## Canada "Discovers" Portable Generator Units

Portable generator units, available in four models producing from 1200 to 3000 kw in single units, are expected to find wide-spread use among Canadian industries and in defense projects, as well as opening up undeveloped areas of the country. According to a statement by F. W. Donaldson, in charge of industrial sales for D. Napier & Sons, Ltd., manufacturer of the Napier Deltic Compak, "Not only will the Compak be used for peak-load, emergency and standby power by utilities, industries, municipalities and government departments, it will be used for mining and remote construction projects, contributing to the northern development of Canada."

## Federal Pacific Announces Price Adjustments

The price of 50 and 100 kvar Cornell-Dubilier high voltage power capacitors was recently increased by Federal Pacific Electric Co., according to an announcement made by R. L. Bobo, vice president of marketing. In ranges of 2400-7900 volts, the 50 kvar capacitor will sell at a net \$117. The 100 kvar Slim Jim power capacitor in the same voltage range will sell for \$234 net. At the same time, the prices of the pole-type racks and stack units were also raised.



I was just sitting there drinking my morning coffee, and they started coming out of the floor plugs. (Cartoon courtesy of PG&E Life.)

Electric Light and Power, April 1, 1961



## Tankless Electric Water Heater Developed

The first tankless electric water heater has been marketed by **Thermotronics Corp.** The unit, called **Microtherm**, is briefcase size and is installed at the outlet where hot water is required rather than in a central location, thereby avoiding heat losses to the water in transmission. The unit operates whenever water is drawn and will provide an endless source of hot water. It does not operate on a standby basis. Efficiency of the unit is 99.6 percent. It works on either a 60 amp or 100 amp feeder and is especially adaptable in electrically heated homes and buildings, as no additional feeder is required. Further, the unit can be employed as a hydronic boiler for full electric house heating, with a rating of 80,000 Btu per hr. The unit has a Union Car-



bide graphite woven fabric resistance element which is non-liming and non-corrosive; the manufacturer guarantees the unit for 10 years. Its key elements are UL approved.

*Circle item #1 on reply card*



45°

90°

## Varistor Photo Control

A new photo control by **Micro Balancing** promises high reliability through use of varistors in conjunction with a secondary lightning arrester. **Lumatrol Mark I** controls are said to withstand all transients up through the capabilities of the secondary arrester. Intensive field tests have indicated no failures of the control due to this cause. Information is described in bulletin 91A.

*Circle item #3 on reply card*

## Aerial Cable Block

The steel channel frame of a new **Sherman and Reilly** aerial cable block is drilled to provide dual pin crossarm mounting at vertical, 45-, and 90-degree positions. The cross-arm bracket is adjustable for all arms through 5 in. wide and is securely attached with a slotted swing plate which eliminates loose pieces. Made in two sizes to take up to 6 in. diameter cable. Both sizes are available with Neoprene sheave lining.

*Circle item #2 on reply card*



Haley poles are strong and insect free

**Haley's**

**CEDAR POLES**

and

**FIR CROSS ARMS**

Light in weight and clean. **PENTA**chlorophenol treated in our modern plant for protection against decay, moisture and insect damage.



TWO strategically located yards:  
**MINNEAPOLIS, MINNESOTA**  
**FINDLAY, OHIO**

**R. G. HALEY & CO.**  
**SPITZER BLDG.**  
**TOLEDO 4, OHIO**





**In Boston**

**even the  
photocontrol  
companies  
are conservative**

Not conservatively *old-fashioned* — just conservatively *careful* about shouting the virtues of something new, before it has had a chance to prove itself.

Fisher-Pierce is a photocontrol company in Boston,\* and has something new: a simplified control with fewer parts and consequently a lower price, and another new control ideal for lower (500) watt applications such as farm buildings, gas stations and the like.

Both look good and both are well worth trying on your job. Neither, however, has the indisputable proof of field experience the "good old" 6600A has . . . yet. Fisher-Pierce Division, Sigma Instruments, Inc., 81 Pearl St., So. Braintree 85, Mass.

\*Well, 15 miles due south of Beacon Hill



**FISHER PIERCE**

**Electrical and Electronic Equipment  
for Industry, Utilities and the Home**



### Concrete Drill

A new portable rotary impact tool, Roto Imp Model JL-200, virtually eliminates setups when drilling through concrete or rebar. Will cut a hole 1 $\frac{1}{8}$ - to 6-in. diameter in concrete. Unit will not fracture surrounding area, even in drilling common brick. Rotates at 1200 rpm and delivers 7200 impact strokes per minute. Will cut at rate of 1 in. per minute up to maximum diameter. By Bill Jack Scientific Instrument Co.

Circle item #4 on reply card



### Lighter Capacitors

New 50-kvar Vorex capacitors are 23 percent lighter and 25 percent thinner than the former design. Size and weight of the 25-kvar unit has also been reduced proportionately. Available with up to 95-kv BIL for 60-cycle voltages from 2400 to 7960 volts, the new units retain the standard mounting dimension of 15 $\frac{5}{8}$  in. Also retained is the principle of extended foils, said to reduce maximum current densities in the foils to one-fifth of conventional designs. By Ohio Brass Co.

Circle item #5 on reply card



# ALCOA ALUMINUM ACCESSORIES ROUNDUP



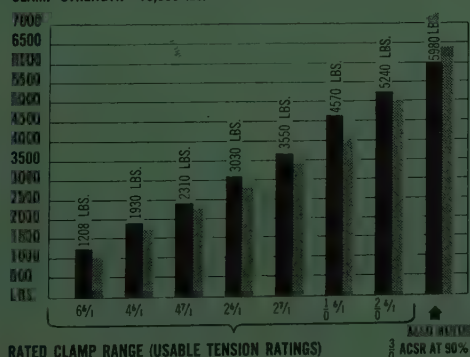
## Very new dead-end clamp

We say "very" new to emphasize the importance (to you) of this clamp. It's designated 301 in our catalog. But that doesn't begin to tell you of its many advantages. Possibly the first thing you will notice is the  $\frac{1}{2}$ -inch aluminum U bolt. That's right —  $\frac{1}{2}$ -inch high-strength aluminum alloy with Alumilite 205 finish and grease film. And the clamp itself? It's compact, cast in one piece of a high-quality aluminum alloy noted for its corrosion resistance. The large pulling eye is an integral part of the structure of the clamp. Makes it easy to use the hoist hook. What about holding power? This full-tension clamp will hold 95% of the rated strength of the conductors for sizes No. 6 to 2/0 ACSR. The bar chart appearing below gives you the full story.

You'll appreciate, too, how easy this new Cat. 301 dead-end clamp is to thread. No kinking or twisting, because that long bolt gives you plenty of freedom. We've also paid attention to details—Alclad washers, the sheared clevis pin for hot stick use, aluminum cotter pin, and such. The biggest news of all may well be price. We'd be happy to discuss it (and all the reasons why the Cat. 301 is such a value) with you.

### ALCOA cat. 301 DEAD END CLAMP

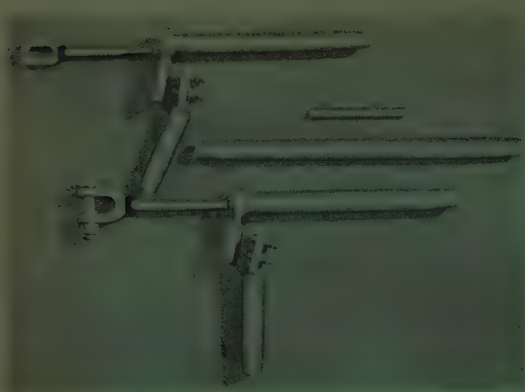
■ ACTUAL TEST RESULTS ■ 95% OF RATED STRENGTH OF CONDUCTOR  
CLAMP STRENGTH—10,000 lbs.



## The question of clamp ratings

How do you rate a clamp? If the figure you've been accustomed to receiving represents the rating of the clamp itself before it breaks, have another go at it. What really counts, as you well know, is the holding power on the conductor—not the tension required to pull the clamp apart. Consequently, we always refer to how the clamp holds the conductor as the usable tension rating. So we provide you with the usable ratings for Alcoa clamps. Makes sense, doesn't it?





## ◀ What to look for in tubular line accessories

Take a look at the picture. These tubular accessories you will find easy to handle and install. Spacing of bolt holes of dead-end tongues is standardized so you can fit any terminals to any dead-end body. Where desired, the tongue can be positioned radially about the axis of the conductor before compression. Note, too, that the  $15^\circ$  angles on dead-end tongues and terminals means you can place the jumper loop in either perpendicular or  $30^\circ$  position with the same accessories. Every item is marked with catalog identification, dies required, and position for compression. Conductor goes in easily. Available for use with standard conductors up to 1,590,000 CM, as well as many of the "special" and large-diameter conductors for extra-high-voltage applications.



## ◀ No more kinking

Why didn't someone think of this before? Deceptively simple in appearance, this wheel-like device holds small parallel-groove clamps, so you can apply torque to the bolt without kinking the wire. In fact, the holder wheel holds two clamps—the Cat. 490.0 for #6-#2 AWG on one side, and the Cat. 396.6 for #6-2/0 ACSR on the other. The grooves on the periphery of the wheel give you a good grip when wearing gloves. What it adds up to is no kinking—a big difference in the appearance of your service lines. Made from aluminum (of course!), the wheel is priced at just \$1.00. How many can you use?



## ◀ How tight is right?

Nobody will argue that bolts must be tight. But how tight? Because they are greased and have smooth surfaces, Alcoa aluminum bolts for accessories develop high tensions at relatively low twisting forces. So, putting the right pressure on—without using an expensive torque wrench—requires skill. How to do it easily by measuring rotation of the bolt in small pg clamps is spelled out in an illustrated bulletin. Send for a copy.

### ROME CABLE DIVISION OF ALCOA Rome, New York

Please send me the items checked below:

- ☐ Data on Cat. 301 dead-end clamp
- ☐ Tubular compression accessories catalog
- ☐ Information on ordering the new Alcoa holder wheel
- ☐ "How tight is right" bulletin

Name .....

Title .....

Company .....

Address .....

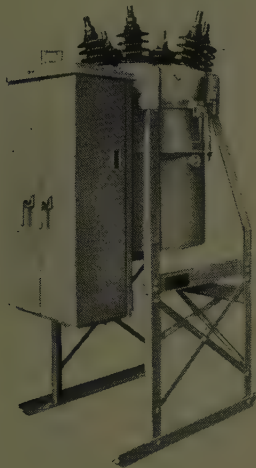
**ROME CABLE**  
DIVISION OF **ALCOA**



## Single Tank Breaker

Type AD-28 single tank oil circuit breaker in ratings of five cycle, 100, 250, and 500 mva for 14.4 kv and below has been introduced by **Federal Pacific Electric Co.** The units are smaller and require less maintenance and installation than similarly-rated units manufactured previously. To install breaker, only 15 sq ft of ground space is required. Utilizes stored-energy motor-compressed spring operating mechanism to insure interruption of less than five cycles.

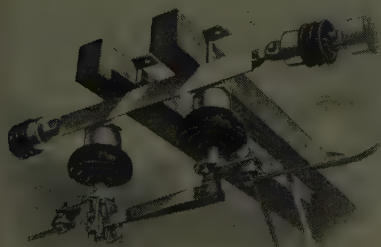
Circle item #6 on reply card



## Disconnect Switch

The Type M2 disconnect switch manufactured by **A. B. Chance Co.** was specifically designed for pole-top applications where the insulation level of the circuit is based on standard distribution equipment. Insulators are cap-mounted for vertical and underhung applications and bases are slotted for single or double crossarm mountings. Available in 200 and 400 amp sizes for 7.8 to 27 kv.

Circle item #7 on reply card



## First in Performance Values

**SLOW DISK SPEED** (10 rpm at rated load) minimizes the effect of current damping on high loads and inherently requires less compensation to produce a more uniform registration curve.

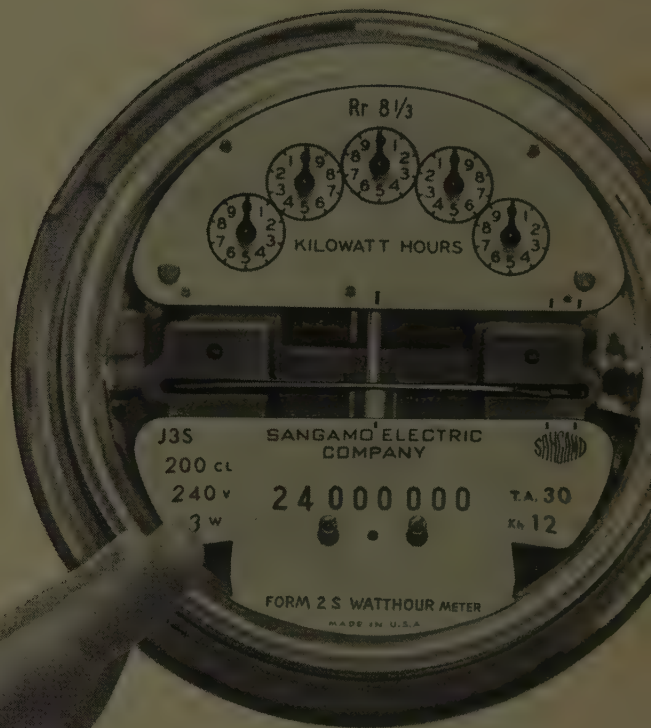
**HIGHEST TORQUE** (from 10 to 100% above other meters) produces better stability . . . more uniform registration . . . more accurate light load performance. Especially helpful when demand registers, cyclometer registers or contacts are used.

**LOWEST LOSSES** (up to 10% less than other meters). While this loss is only 10 kwhr per year on a single meter . . . multiply by the total number of meters in service. The answer will surprise you!

**REFINED TEMPERATURE COMPENSATION** is an important element in meter performance. From  $-30^{\circ}\text{F.}$  to  $+150^{\circ}\text{F.}$ , superior J3 temperature compensation gives almost perfect straight line accuracy.

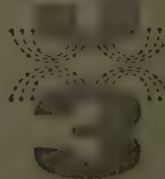
**COMPARE** disk speed, torque, watts loss, temperature compensation. To these features, add the superior magnetic moving system. That's the J3, first in performance values.

**SANGAMO ELECTRIC COMPANY** / **SPRINGFIELD ILLINOIS**



*Unsurpassed  
in  
Metering  
Value...*

true  
MAGNETIC  
flotation





**EXTRA Holding Power  
QUICKLY Installed  
TOUGH For long life**



## EVERSTICK ANCHORS

For new construction and maintenance —Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resilient, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

**EVERSTICK ANCHOR CO.**  
FAIRFIELD, IOWA

### Four Fine Facilities in PITTSBURGH



**ALLEGHENY MOTOR INN** Opposite Greater Pittsburgh Airport. 60 air-conditioned rooms, tile bath, TV, radio, phone. Superb restaurant and cocktail lounge. Year-round swimming pool. Courtesy car to and from airport. AMherst 4-7790

**HOTEL PITTSBURGH** In the heart of the Golden Triangle. 400 outside rooms, bath, TV, radio, air-conditioning. General Forbes Lounge & Dining Room. ATlantic 1-6970



**JACKTOWN MOTOR HOTEL** 1 mile west of Irwin Interchange on Route 30. 60 air-conditioned rooms, TV, telephone, combination tile bath. Facilities for dining and group parties. UNderhill 3-2100



**HOTEL PITTSBURGH** Opposite Greater Pittsburgh Airport. 56 air-conditioned rooms, tile bath, radio, TV, phone. Courtesy car to and from airport. AMherst 4-5152



\*Teletype Service. Telephone any Knott-Hotel. All Knott Hotels and offices in U.S. connected by teletype.

Joseph F. Duddy General Manager



## MEN OF POWER

### El Paso Electric Promotes Armstrong, Davis

John F. Armstrong has been elected vice-president of the El Paso Electric Co. As vice-president, he becomes manager of Mesilla Valley division, succeeding John A. Davis, Jr., who has been promoted to new responsibilities.



Armstrong

Mr. Davis, who has been manager of Mesilla Valley division for the last 13 years, has moved to the company's El Paso headquarters.

Mr. Armstrong has been general

engineer for the past eight years. He originally began his career with El Paso Electric in 1933 at its Rio Grande Power Station. He rose through the positions of meter test engineer, industrial sales engineer, distribution engineer, assistant to the general superintendent, transmission engineer, special assignment engineer, and general engineer.

Mr. Davis joined the company in 1927 as general superintendent of the New Mexico division. In 1947 he was elected first secretary of the corporation and then vice-president in charge of the New Mexico operations.

### Carolina P&L Announces Five New VP's

Directors of the Carolina Power and Light Co. have elected five new vice-presidents. They are: A. J. Skaale, H. G. Isley, D. E. Stewart, E. N. Pope, and Shearon Harris.

Mr. Skaale heads the operating and engineering department, Mr. Isley is general sales manager, Mr. Stewart is manager of area development, Mr. Pope is advertising and sales promotion director, and Mr. Harris is associate general counsel.

The new vice presidents range from veterans to a relative newcomer to the utility industry.

Mr. Skaale has been with CP&L since 1930. For eight years previous he was with a west coast utility. He is a graduate of the University of California.

Mr. Isley, a Duke graduate, has been with the company since 1919, when he joined the utility as a salesman. He progressed steadily, to head all appliance sales in 1926, all residential and commercial sales in 1934, and general sales in 1940. He is active in EEI and the Southeastern Electric Exchange.

After two years, with Westinghouse, Mr. Stewart joined CP&L in salesman, and division superintendent-1925, serving as an engineer, power ent. Active in several regional chambers of commerce and trade as-

sociations, he is a nationally known industrial development specialist.

Mr. Pope has been with the utility steadily since 1923, having served as salesman, residential sales manager, and advertising manager. He is a past president of the Public Utilities Advertising Association.

The newcomer to the industry is Shearon Harris. He served as principal clerk of the House of Representatives in 1941 and 1943 and a member of the House from Stanly County in 1955. He is a past vice-president of the North Carolina bar association where he worked to improve legal procedures and court administration.

### Stone & Webster Canada Names Curtiss V-P, GM

Glenn H. Curtiss has been named vice-president and general manager of Stone & Webster Canada, Ltd., succeeding Leonard L. Youell who retired January 1.

Mr. Curtiss, a civil engineer with degrees from the University of Toronto and the Harvard Business School, joined the Canadian subsidiary of Stone & Webster, Inc., in

(Continued on page 59)



## Men of Power Briefs

### UTILITIES

**Radlph Zeuthen** has been named vice-president and account supervisor for Compton Advertising, Inc. Mr. Zeuthen was formerly manager of the EEI Live Better Electrically program.

Two announcements by Tampa Electric Company include **G. D. Leach's** promotion to commercial sales manager from his former position as cooking and air conditioning engineer, and **M. D. Wilcox's** new position as supervisor-trouble department from assistant chief distribution dispatcher.

**John F. Anderson** has been named assistant to the general manager of Power Reactor Development Company (PRDC), the nonprofit organization building the nuclear portion of the Enrico Fermi Atomic Power plant near Monroe, Michigan. Mr. Anderson, who is assistant secretary and assistant treasurer of the company, also serves as resident engineer at the Fermi Plant site. His new duties will be in addition to present responsibilities.

New manager of Philadelphia Electric Company's Philadelphia Division is **Henry R. Flanagan**. Mr. Flanagan will also continue to serve in his former capacity as manager of the customers service department, a position he has held since 1952.

**Robert P. Bailey** has succeeded **E. M. Smith** as Duke Power Company's chief claim agent. Mr. Smith, who retired from the position he has held since 1934, will remain active as supervisor of workmen's compensation claims.

Appointment of **Harry F. Pearson** to head of standardization program for Pacific Power & Light Company has been announced by **Corbett McLean**, supervisor of PP&L's engineering division. Mr. Pearson will have charge of distribution system construction specifications and standardization of construction materials throughout the PP&L system.

**Lawrence E. Weber**, formerly municipal sales manager, has been named assistant to the vice-president of Metropolitan Edison Company. His appointment to the position, which includes sales activities throughout the MECO system, was announced by **T. O. McQuiston**, vice-president and general sales manager. At the same time, Mr. McQuiston announced the appointment of **Leonard P. Harris**, as director of publicity for MECO.

**R. W. Smith** has been designated manager of marketing by the Pennsylvania Electric Company and the Metropolitan Edison Company. Formerly director of residential and farm sales, Mr. Smith's new responsibilities will include preparation of sales plans, training programs, promotional activities and forecasting for the two systems. In addition, **J. Bruce Walker**, has been promoted from supervisor of advertising to advertising director.

Detroit Edison vice-president **Donald F. Kigar** has announced the appointment of **Lynden J. Kaufmann** as manager of union relations for the company. The former director of negotiations will be accountable for interpretation and negotiation of all union contracts and agreements, as well as government agency relations regarding union matters. Promotion of **John M. Maguire** as administrative head of the union relations department, with the title of director, was also announced.

Other Detroit Edison appointments include: **George J. Brown** as assistant manager of construction; and, **Paul A. Duker**, as director of industrial sales. Mr. Duker was formerly senior industrial sales engineer for the company.

**Peter A. Stover**, chief mechanical engineer, has been promoted to director of purchasing and stores at Iowa Electric Light and Power Company, Cedar Rapids. He replaces **Marvin Wright** who is retiring after 25 years with the company.

**Alex R. Newel**, a veteran of 35 years' service with West Penn Power Company, has been promoted to western division manager for the

**Name Curtis . . . from page 56**

1955. He became vice-president in 1959.

Mr. Youell opened Stone & Webster's first permanent office in Canada in 1945. When Stone & Webster Canada was organized in 1950 he became manager of the Toronto office. He rose to vice-president in 1952 and became vice-president and general manager three years later.

Mr. Youell will continue to serve on the Canadian firm's board of directors.

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utility, with headquarters near Washington. Mr. Newell, who has been assistant to the vice-president—division operations at the general office in Greensburg, succeeds **J. Vincent Soisson**, who earlier was named the utility's director of marketing.

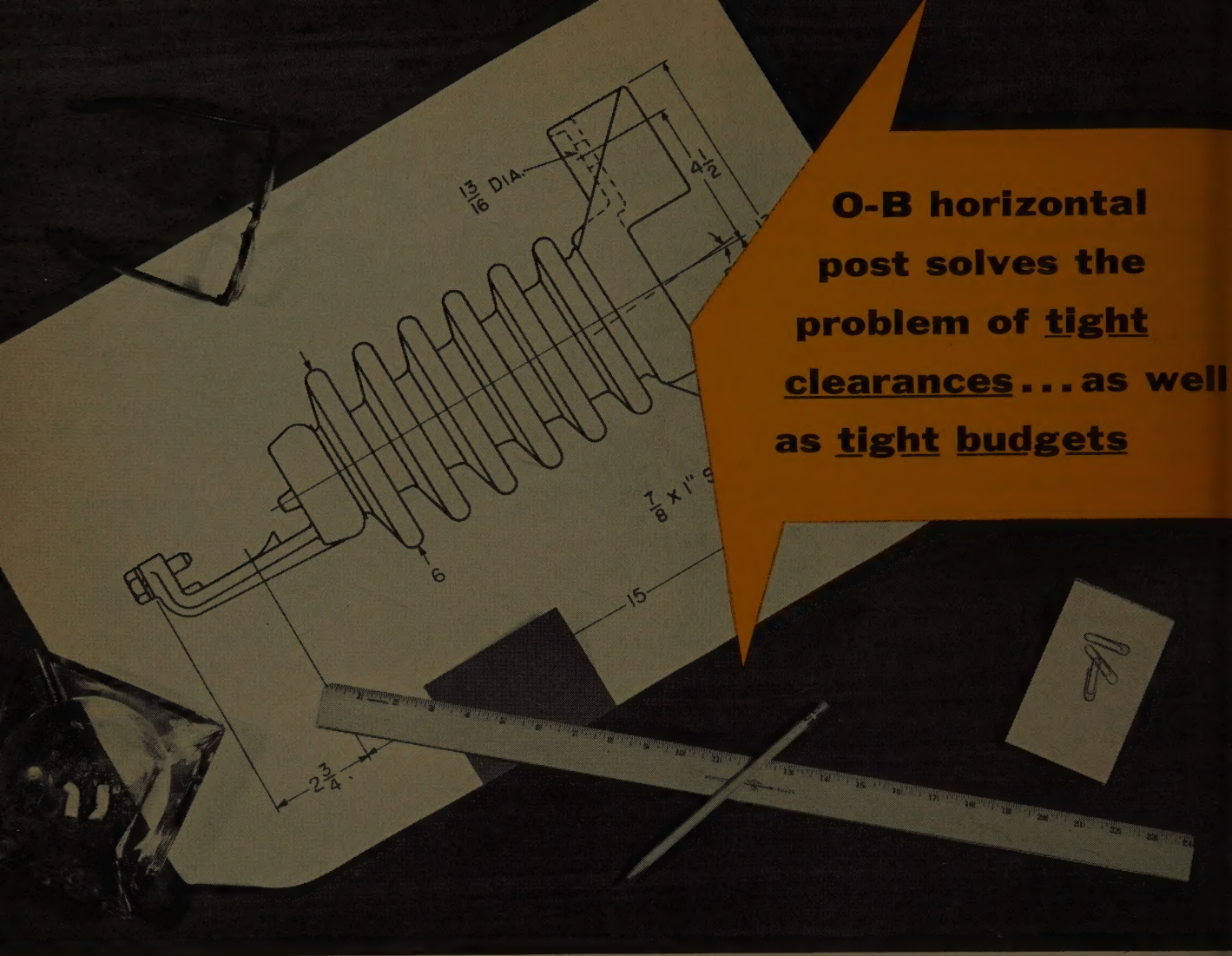
Four Montana Power Company's engineering and purchasing department men have received new assignments: **Ray M. Ball**, chief engineer of the company since 1954, will continue in that capacity with general supervision over all engineering but will concentrate on special project and planning activities; **Carl R. Davis** will be advanced from assistant manager to manager of the engineering department in charge of administrative and personnel activities; **Roger A. Hofacker**, who has been manager of the purchasing department since 1957, will advance to assistant manager of the engineering department; and, **Dan H. Pyfer**, superintendent of distribution design in the engineering department, will succeed Mr. Hofacker as manager of the purchasing department.

**Roger Ernst**, former Assistant Secretary of the Interior, has assumed a new position as planning consultant for Arizona Public Service Company.

The Virginia Electric and Power Company has announced the appointment of **James V. Barker**, former assistant superintendent of construction, to superintendent of construction.

Replacing **Harold D. Wright** who retires from Pacific Gas and Elec-





**O-B horizontal  
post solves the  
problem of tight  
clearances... as well  
as tight budgets**

# It's got something for you

➡ How would you like to be able to build lines as high as 22 or 34.5 kv only 26 inches wide? How many former problems of close clearance would this have solved?

O-B horizontal line posts in primary distribution voltage ratings are a welcome solution to the question of tight quarters. They project only 17¾ inches from the pole face. They act as both insulation and crossarm. By keeping all phases on one side of the pole, the total width of both pole and insulator is only about 26 inches.

Out in the open, they have other virtues. Each horizontal post eliminates a crossarm and braces, and part of the time needed to install them. Everything can be built on the ground. As soon as the pole is set, you are ready to string conductor. Because posts are inherently quiet, radio interference

complaints practically disappear. This condition is greatly aided by the new design of O-B Clamptop that replaces tie wires with a solid mechanical grip on the conductor. Lastly, they make a mighty clean-looking line.

When you plan to put up new primary circuits take a careful look at the new O-B horizontal line post. It's got something for you!

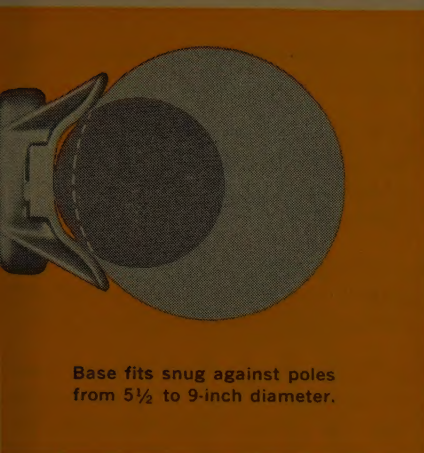
OHIO BRASS COMPANY, MANSFIELD, OHIO

**Ohio Brass®**  
PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS  
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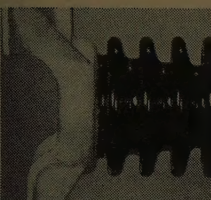


## A FEW FEATURES OF THE O-B HORIZONTAL LINE POST



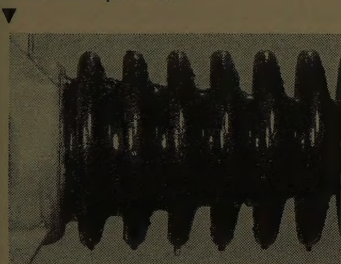
Base fits snug against poles from 5½ to 9-inch diameter.

Broad contact area of base prevents crushing of wood fibres. Stays tight.

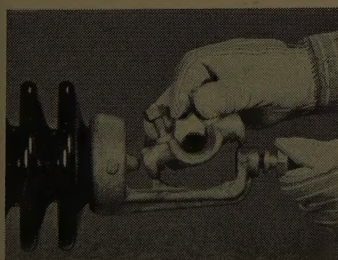


▲ High strength cemented assembly with treated sanded surface imparts permanent durability. This technique has been applied with complete success to millions of insulators working under mechanical load.

Because water drip falls off each flange independently, the horizontal post has 10 to 15 per cent higher wet flashover rating than a vertically-mounted equivalent.



▼ New O-B Clamptop has exclusive design features that make working with hot sticks or heavy gloves extremely easy. Clamping member practically drops into proper place on the saddle. All tie wires are eliminated.



## Men of Power Briefs (Continued)

tric Company after 41½ years of service, will be **Norman M. Scofield**. Mr. Scofield has been named manager of Line Construction.

**George F. Herrmann, Jr.** has been appointed station superintendent of VEPCO's Chesterfield Power Station, near Richmond. Mr. Herrmann replaces **Ralph C. Palm**, who has retired.

**Herbert W. Sears** has been appointed purchasing agent for Connecticut Light and Power Company. He succeeds **Frank M. Reinhold**, vice-president of purchasing.

**Larry J. Aubrecht** has been named director of western regional operations for the Management Consulting Division of Ebasco Services Incorporated with offices in San Francisco. This position was formerly held by **H. K. Breckenridge** who has been appointed to the staff of Ebasco's New York headquarters.

## MANUFACTURERS

Two new executives named at De Laval Steam Turbine Company are **M. B. Sennet** as assistant to the vice-president and **Donald T. Bixby** as manager of the IMO department.

After 25 years of service with the Joslyn Mfg. and Supply Co., vice-president **Elton R. McCoy** has retired.

**Ralph Pyle** has been promoted to chief electrical engineer at Copperweld Steel Company's wire and cable division. Mr. Pyle will make his headquarters at Glassport, Pennsylvania.

The Babcock & Wilcox Company announced the appointment of **Wayne T. Marshall** as manager of sales service for the refractories division.

The appointment of **Werner E. Toensing** as sales manager of the customer commercial and utility truck body department of York Body and Equipment Company has been announced.

Announcements from General Electric of promotions and appointments include: **Philip H. Light**,

who has been named manager-Electrical Utility Analytical Engineering for the company's Electric Utility Engineering Operation, and **Dr. Pier A. Abetti**, who has been promoted to manager of the Electrical Engineering Laboratory. Dr. Abetti is succeeded by **Donnell D. MacCarthy**, who has been appointed manager of the GE Project EHV. **C. Frederick Schaus** has been named as manager-Industrial Appearance Design for GE's Electric Utility Engineering Department, and **George H. Hupman** has been appointed manager of marketing in the Power Transformer Department.

**Edward J. I. Davies** has been promoted to district sales manager in Philadelphia for the Anaconda Wire and Cable Company. He succeeds **William S. Shanahan** who has advanced to manager of sales, Government and Defense Division.

I-T-E Circuit Breaker Company has announced that **Elton W. Turner** has been advanced to assistant sales manager of the Victor Insulators division.

**F. D. Lapham** has been appointed general administrative manager of Electro-Motive Division of General Motors.

New Eastern sales manager for Riley Stoker Corporation will be **F. R. Callowhill**.

**J. R. MacDonald**, president and chairman of the board of General Cable Corporation, has announced the appointment of **S. E. Yeaton** as assistant vice-president. He formerly was sales director of electrical wire and cable for John A. Roebling's Sons Corporation.

**Kuhlman Fluehr** has been appointed western regional sales manager of Kuhlman Electric Company.

**Blaine Beck**, formerly vice-president in charge of manufacturing of Tuttle & Kift, division of Ferro Corp., has joined Precision Transformer Corp. in the capacity of vice-president in charge of manufacturing.

**Louis S. Goldberg** has been appointed director of marketing for the Buell Engineering Co., Inc.



# CALENDAR OF EVENTS

April 4-6—Public Safety Institute, Purdue University, 8th Annual Industrial Fire Control Conference, Lafayette, Ind.

April 5-6—North Carolina State College, The South Atlantic Wood Utility Pole Conference, State College Campus, Raleigh, N. C.

April 6-7—American Society of Mechanical Engineers, Management Engineering Conference, Statler-Hilton Hotel, New York, N. Y.

April 6-7—Pacific Coast Electrical Association, Engineering and Operating Section, Ambassador Hotel, Los Angeles, Calif.

April 10-14—American Society of Civil Engineers, Annual Convention, Westward Ho Hotel, Phoenix, Ariz.

April 12-13-14—Missouri Valley Electric Association Engineering Conference, President and Muehlbach Hotels, and Municipal Auditorium, Kansas City, Mo.

April 13-14—Southeastern Electric Exchange, Engineering and Operation Section Conference, Hollywood Beach Hotel, Hollywood, Florida.

April 16-18—Rocky Mountain Electrical League, Spring Conference, Harvest House, Boulder, Colo.

April 17-19—A & M College of Texas, Fourteenth Annual Conference for

Protective Relay Engineers, College Station, Tex.

April 17-18—Pacific Coast Electrical Association, Business Development Section, Sheraton - Palace Hotel, San Francisco, Calif.

April 20-21—Edison Electric Institute, Industrial Relations Committee, Joint meeting with Personnel Administration Section, Southeastern Electric Exchange and the Southwestern Personnel Group, Roosevelt Hotel, New Orleans, La.

April 23-May 6—National Management Association, Third Annual Advanced Management Institute, Granville Inn, Granville, Ohio.

April 23-29—Planning Seminar (Unit I).

April 26-27—Indiana Utility Association, Twenty-first Annual Young Men's Utility Conference, Severin Hotel, Indianapolis, Ind.

April 27-28—Pacific Coast Electrical Association, Administrative Services Section, Villa Hotel, San Francisco, Calif.

April 30-May 6—Direct-Motivating Seminar (Unit II).

May 1—Interstate Power Club, Beverly Hotel, New York, N. Y.

May 2-4—American Society of Training Directors, Inc., 17th Annual Confer-

ence, Bellevue-Stratford Hotel, Philadelphia, Pa.

May 8-10—Instrument Society of America, 4th National ISA Power Instrumentation Symposium, LaSalle Hotel, Chicago, Ill.

May 17-19—Pacific Coast Electric Association, Annual Convention, Sheraton-Palace Hotel, San Francisco, Calif.

May 18-19—Pennsylvania Electric Association, System Operating Committee, Sky Top Lodge Hotel, Scranton, Pa.

May 22-24—American Institute of Electrical Engineers, American Rocket Society, Institute of Radio Engineers, Institute of Aerospace Sciences, and Instrument Society of American, National Telemetering Conference, Sheraton Towers Hotel, Chicago, Ill.

June 11-13—Wisconsin Utilities Association, Accounting Section Conference, Dell View Hotel, Lake Delton, Wis.

June 13-14—National Safety Council, Public Utilities Section, Executive Committee, Laurentien Hotel, Montreal, Quebec, Can.

June 28-30—American Institute of Electrical Engineers, Instrument Society of America, American Institute of Chemical Engineers, American Society of Mechanical Engineers, Institute of Radio Engineers, Second Joint Automatic Control Conference, University of Colorado, Boulder, Colo.

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